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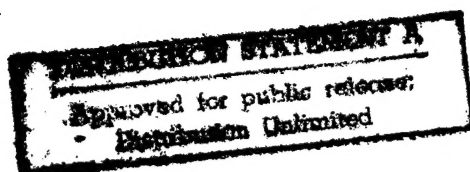
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SCIENCE AND TECHNOLOGY

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16 January 1985

EAST EUROPE REPORT SCIENCE AND TECHNOLOGY

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CEMA DEVELOPMENT, PRODUCTION OF INDUSTRIAL ROBOTS

Ambitious Development Plans

Warsaw ZYCIE WARSZAWY in Polish 11 Oct 84 pp 1, 6

[Article by (b.k.): "How Can the Polish Engineering Genius Be Revealed? A Program of Industrial Robot Construction"]

[Text] The production of automata and robots of a low, medium or high "intelligence" has been growing in the world at an annual rate of 30 to 40 percent. New ever more sophisticated generations of automata supplement or replace the earlier models. Robots that can perform functions because they have a specific built-in program are being replaced by robots which not only perform what they have been programmed to do but also are capable of choosing the best alternative program depending on the circumstances.

The third generation of robots are the so-called "intelligent" systems which can also design programs of their own activity depending on information written in their memory and their own previous learning.

Robotics has been around for two decades, as was noted at the session of the Section of Technical Sciences which took place on Oct 10, 1984. It has become one of the most specialized branches of economic progress, and it is the arena of acute competition on the world market. Poland has little ammunition to take part in that struggle. Even on CEMA markets, there are no Polish robots.

The leading nation in the world is Japan, where 150 major manufacturers are producing robots sold on the world market. The second place is held by the United States, with 50 companies, and the third is Sweden. Among the CEMA nations, the USSR, the GDR and Bulgaria are embarked on ambitious plans for robotics development. Electronics and robotics are necessary for the future of industry to work more cost-effectively and with higher precision.

At the session, the question was asked whether the same operations could not be done by humans, and would it not be easier? Certainly, this is so, only nobody wants it anymore. There are no people willing to do such jobs as

painting metal surfaces, welding under difficult conditions, working under water, working in contaminated areas, etc. In the same vein, one could question the need for electric traction in mines. After all, horses would do as well.

"We have lost the first stage in robotization game," noted Professor Stefan Wegrzyn, author of multiple use automatic systems and lately the developer of the ComPAN-8 personal computer.

Today, we must make sure that we do not lose the future chances. Professor Wieslaw Traczyk, speaking at a meeting of the Section of Technical Sciences, described the basic research problems in robotics. The plans of the Institute of Basic Technological Problems in that area were reported by Professor Henryk Frackiewicz. In particular, he said, "We need industrial robots to perform such engineering jobs as welding, painting, transport in difficult conditions. Robots must replace people where human speed and precision of response is insufficient."

In Poland, work in industrial robotics is conducted in several institutes, including the Industrial Institute of Automatics and Measurement, the Institute of Precision Mechanics and the Central Bureau of Machine Tool Design in Pruszkow. Studies are mainly concerned with manipulators and first-generation robots. There is no work on more advanced robots of second and third generations. These studies are necessary and should be initiated. The Institute of Basic Problems in Technology suggested 20 subjects for research and forecast. Decisions as to implementation of these projects should be taken before the beginning of the 1986-90 five-year period.

The desire to take part in this program was voiced by the representative of the Ministry of Construction and Building Materials. The Ministry of Metallurgy and Machine Industry has prepared a robotization program which will soon be discussed by the Government Presidium.

Until now, there has been no industrial production of robots in Poland. Scientific institutes can make them only on an experimental scale. Not only funds are needed to manufacture robots, but it is also necessary to have the means of introducing them into industry, which involves production of auxiliary equipment which determines the organization of the production process. A survey of major domestic technologies that require the introduction of robots has been prepared. These projects receive tax incentives and greater funds for development. Scientific research involved with automatics and robotics will also have priority. This priority, however, belongs to projects which are necessary for the economy. A compendium of scientific and implementation projects is being developed.

Robotization Regarded as Priority

Warsaw TRYBUNA LUDU in Polish 28 Nov 84 p 4

[Article by Tomasz Miecik: "Robots Are Gaining a Foothold"]

[Text] Robots in this country exist in limbo. It is unclear how they should be manufactured, and they are applied reluctantly because they are expensive and unreliable. Their past was hazy, but currently, as far as one can judge, they are finally moving into the clear.

The term "robot" was created 60 years ago. It was coined by the author Karel Capek, who used it to describe artificial creatures simulating man. In Poland, however, they can still hardly stand on their feet.

At a recent meeting of the Government Presidium which discussed the issues of the future of electronics, automation and robotization in Poland, Janusz Maciejewicz, the minister of metallurgy and the machine industry, reported that in the past few years 600 robots were produced in Poland; 370 of these have found employment. Vice Premier Zbigniew Szalajda explained the limited demand for industrial robots on the part of enterprises by the fact that they have not attained technological maturity and reliability. The process of introducing them is still too long and expensive, while the degree of industrial organization at the enterprises is often inadequate.

An Egg in an Artificial Palm

Recently, I watched in the GDR a robot picking eggs from a cardboard box and putting them into another (the eggs were not sorted and were of different size). Not a single egg was broken. This was, of course, a show demonstrating the precision of this new type of robot. This type illustrates the promising new generation of robots with high operational precision and efficiency. Since the mid-1980's, so-called intelligent robots will become commonplace, and will have two sense organs: touch and sight.

These robots will find new applications. They will be used for hard labor, mainly in machine industries, mining and metallurgy, and in special environments such as research in space, under the sea and in nuclear energetics. Other applications will include complicated functions, such as product quality control.

Experts predict that robots, like other modern products, will inevitably be introduced into military or paramilitary spheres. The United States has already designed prototype sentry robots which are equipped with machine guns and grenade launchers and are to be used to guard communications lines, pipelines, airfields, military bases, etc.

As robots become upgraded, their performance is improved. No exact data are available, because so far there is no uniform definition of an industrial

robot. Looking at data from different nations, however, it can be safely assumed that the existing robots replace from two to five employees in a two-shift work schedule. The indicator of productivity growth at lines equipped with robots differs depending on the industry. The values, however, are quite high--from 20 percent and up. There is also a savings of materials, such as of paint, when robots are used.

Since there is no exact definition of an industrial robot, it is difficult to estimate how many of them are currently used around the world. This number should be in the area of 80,000. Japan is leading in robotization, where 120 companies produce robots. One of these factories is completely automated: robots are making robots.

Introducing automation is now a major development trend in world industry, and robots and manipulators are basic tools in implementing it. Experts call for a rise in the number of robots in the coming decade at a pace of 30 to 35 percent annually.

If this forecast is true, and there is every indication that it is a conservative one, by 1990 100,000 robots will be operational in the world. These will be more efficient robots, each replacing at least seven persons. If manipulators are included in the count, the numbers become astronomical. Already, about 35,000 such units of equipment have been installed in the GDR. In the coming 10 years, 120,000 robots and manipulators are expected to be introduced into metal industries of the Soviet Union, freeing about 350,000 workers to be employed on other jobs.

Outlandish Technology

Introduction of robots into industry does not always proceed smoothly, and our troubles mentioned earlier are not an exception. Professor A. Braun from the GDR, discussing the application of robots in the East German industry, which is, after all, more advanced, writes that the primary task is to ensure that a modern robot not be an insular enclave in a workshop furnished with equipment dating back to the 1960's. Production should be organized to adapt itself to the capacity of robots and the technology they embody, that is, comprehensive intensification should be achieved.

Latest-generation robots with other automation means have been estimated to offer a savings of labor of up to 30 percent (while first-generation robots yielded only 2.0 to 3.5 percent). That means a growth of productivity per employee of close to 25 percent and a general output growth of 9 percent. This is predicated on the adequate preparation for introducing each robot, however.

Experts state that introduction of one robot involves changes at three to five workplaces and ultimately dismissal of one worker. The introduction of robots is organizational as well as technological in its nature. The experience of our friends from the GDR, who are more advanced in the field of robots, indicates that about one-third of industrial workers are engaged in

manual jobs. Of these, about 40 percent are engaged in assembly operations, where about 70 percent of all work is manual. If all these manual operations should be replaced by robots, the GDR would have to spend about double its current annual capital investment for the switchover. This is, of course, impossible. Robotization, therefore, and this is important, should be concentrated on where it is likely to produce the best yields in effectiveness.

What Are the Chances?

All this looks a little like counting the chickens before they hatch. We produce few robots and use appropriately even fewer. What are our chances of meeting the demand of the times and coming in line with the world trends in modernization of our production?

An expert on this issue, the director of the Institute of Precision Mechanics, Professor Jerzy Buc, believes that Poland has appropriate conditions for developing the production of industrial robots, especially those that can meet the demands of our industry at its current technological level. Industry's doubt as to the robots' reliability is due to poor quality of subassemblies more often than to design imperfections.

Although the general scope of robotization in our industry is limited, we have such factories as Passenger Motor Car Works in Warsaw or Wola Steel Works, where robots, first installed for trial, eventually became intrinsic parts of many production processes.

Currently, there is a promise of better times for robots. The Government Presidium at its meeting on Nov 5, 1984, adopted a guideline program for development of industrial robotization until 1990 and a schedule of projects in this area. The tasks outlined in this program will be the responsibility of interministerial groups set up by the Government Presidium.

There are solid foundations for implementing this program. These include the robot and manipulator designs which are fairly good and continuing modern licensing solutions. We have a fairly large number of experts working at research and development centers. Cooperation in robotization in the framework of the CEMA is also expanding. Robotization has been recognized in programs of international cooperation in the socialist community as a priority area.

It is expected that successful introduction of robots into industry will above all help overcome labor shortages, especially on heavy jobs involving life and health hazards and tedious work. Subsequently, automation and robotization will be directed at improving the productivity and product quality, but this will only happen after robots learn to stand firmly on their feet.

CEMA JOINT ROBOTICS TECHNOLOGY DEVELOPMENT, PRODUCTION DISCUSSED

Halle FREIHEIT in German 2 Nov 84 p 8

[Article by Michail Melkonyan, APN]

[Text] The CEMA countries are devoting much attention to robot engineering which is intended considerably to increase the effectiveness of social production. A complex program for the development, production, and use of robots and automated handling equipment is being carried out in the Soviet Union. During this 5-year plan, about 50,000 are to be produced. During that same period of time, 75 automated systems and sectors are to be created in order to relieve about 100,000 persons of heavy labor. Between 1981 and 1985, 45,000 robots will be used in the GDR; corresponding national programs are being carried out in Bulgaria and in Czechoslovakia. In this way, a foundation is being created for the next stage in the development of the production forces. The social consequences of robotics must not be overlooked either because, after all, they do relieve many workers of heavy, monotonous, and uninteresting work.

About 20 years passed between the first and the third generations of electronic computers. Robotics will be developed much faster. While the representatives of the first generation can reproduce the programs put into them only in a mechanical manner, most robots already during the middle of the 1980's, will have a "technical eye": Adaptive robots of the second generation can be adjusted to the altered production conditions. In 1990, robots will independently make decisions on the accomplishment of certain production tasks. These robots are third-generation machines that constitute the core of completely automated sections and plants.

"A country just by itself, moreover, a small country, cannot reach world standards in this field," remarked Ladislav Supka, former minister of technical and investment development of Czechoslovakia, and deputy CEMA secretary since last year. In 1975 already there were regular consultations between Czechoslovak and Soviet engineers. Just 4 years later, both countries started the development of some industrial robots, especially for the operation of cutting machines, presses, and casting machines. A complex for automated welding, equipped with robots, represents a considerable result of cooperation between Bulgarian and Soviet experts.

A series of agreements regulates cooperation between Soviet experts and especially experts from the Hungarian People's Republic, from the GDR, and from the Polish People's Republic. An agreement concluded in 1982 between the Bulgarian People's Republic, the Hungarian People's Republic, the GDR, the Polish People's Republic, the Romanian Socialist Republic, the USSR, and Czechoslovakia, is aimed at multilateral cooperation. It calls for joint research and development as well as production cooperation in the manufacture of standardized modules, structural components, individual parts, and peripheral complexes.

To be able to accomplish certain tasks together, the participating countries must draft a uniform technical concept. Such a concept was coordinated recently in the field of robot engineering. A series of measures, aimed at the implementation of the multilateral agreement, is being carried out on its basis. It has been provided, for example, that both individual robots and entire systems, equipped with robotics, are to be assembled from modules which will be produced in various countries. According to calculations by experts, this will make it possible to cut the costs of the produced machines by half. The start of series production is made considerably easier.

"In spelling out this basic principle, we started with the idea that, as the output volume grows, its economic benefit also increases," declared Professor Yevgeniy Yuryevich, chairman, CEMA Council of Robotics Chief Designers. The work being done by this council for the organization of multilateral cooperation was approved by the CEMA Executive Committee.

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INTERNATIONAL AFFAIRS

GDR-HUNGARY DEVELOP ELECTROMAGNETIC METALWORKING EQUIPMENT

East Berlin FERTIGUNGSTECHNIK UND BETRIEB in German Vol 34 No 10, 1984
pp 600-601

[Article by J. Erdoesi, Engineer, GTI, Budapest and M. Meinel, Engineer,
Zwickau College of Engineering/

[Text] The principles of electrical high-speed working (electromagnetic shaping, electrohydraulic shaping) and possible uses were publicized in numerous ways during the 1960's; reference was made here above all to the advantages. Industry therefore expected a lot from this new process.

Although these high expectations could not immediately be met at that point in time, rather considerable work was being done worldwide in an effort to perfect the individual methods. Today, more and more specific cases of practical use are being listed in the technical literature on the subject; these cases lead to a technical and economic delimitation of the area of application. Electrical high-speed working in the metal-working industry today has a firm place and is being used with reference to the special aspects connected with the action principle. They reside essentially in the fact that special machines are necessary, on the one hand, and that, on the other hand, requirements are being established for the work pieces to be processed, for example, good electrical conductivity and compact surfaces. Here it turned out that, especially in the case of electromagnetic shaping, based on the arising advantages, good results can be achieved as compared to the conventional shaping methods (contactless force transmission, elimination of lubricants, acceptance of larger than hitherto customary tolerances). Particularly good successes have been achieved here in the combination of metal parts and in the combination of metal parts on nonmetals, for example, (1-14).

Electrohydraulic shaping on the other hand was unable to make a breakthrough to that extent. To be sure, broad-scale use of the fundamental electrohydraulic effect did emerge in outline in foundry engineering in cleaning-room systems (15, 16).

Initial development work on these methods of high-speed working led to a series of publications and to direct contacts between experts on an international basis, both during scientific congresses and also directly in the context of scientific-technical cooperation between CEMA countries.

Advantages arise for all partners (for example, faster development of certain technologies, lower costs, avoidance of duplication of effort) if there is cooperation, based on division of labor, in these special marginal areas of shaping technology.

One of these cooperative efforts, which must be emphasized specially, has been under way in this connection since 1970 between the Hungarian People's Republic and the GDR; on the Hungarian side, the GTI Budapest and on the GDR, the Zwickau Research Center for Shaping Methods until 1976 and the Zwickau Engineering College since 1977 have been partners. In this effort, the GTI is working toward technological developments, toward machinery developments (see Table 1) for electromagnetic shaping, and the use of the electrohydraulic effect for casting cleansing, while the Zwickau Engineering College is working toward technological developments, toward the design of tools and mechanisms, and toward the technological process as such (in addition to the determination of the necessary technical data for the systems required for electromagnetic shaping), whereby all investigations are being conducted on a multipurpose 60-kJ surge-current system.

Table 1. Technical Data for Electromagnetic Shaping Machines of GTI, Hungarian People's Republic

Typ 1	EMA-M5	EMA-M10	EMA-M20	EMA-M30	EMA-M50
2 Max. gespeicherte Energie in kJ	5	10	20	30	50
3 Kapazität der Kondensatorbatterie in μ F	180	300	540	1080	1440
4 Ladungszeit bei max. Energie in s	7,45	8,18	8,60	7,45	8,35
5 Netzanschluß in V; Hz	380; 50	380; 50	3 \times 380; 50	3 \times 380; 50	3 \times 380; 50
6 Abmessungen:					
Breite in mm	760	1220	1220	1220	820
Länge in mm	1220	1520	1400	1600	2820
Höhe in mm	900	900	2250	2250	2250
7 Masse in kg	600	1200	1400	3200	5000
8 Taktzeit bei max. Energie in s	10	20	30	30	30

Key: 1--Type; 2--maximum energy stored, kJ; 3--condenser battery capacity in micro-Farad; 4-- charge time at max. energy, sec; 5--grid connection in v; Hz; 6--dimensions: width in mm, length in mm, height in mm; 7--weight in kg; 8--stroke time at maximum energy, in sec.

On the basis of the work done by the GTI, it was possible to refrain from engaging in a separate system development effort in the GDR and, during

the introduction of specific technologies, it was possible to concentrate on close cooperation between both institutions in the metalworking industry of the GDR.

Examples of this type of cooperation, based on division of labor, are the production activities for work pieces entitled "attenuator mass for torsional-vibration balancer" (1, 2) at the Rosslau Elbewerk VEB on a model EMA-M50 magnetic shaping machine and "parallel-corrugated metal hose" in the Zwickau Metal Hose Works VEB on an EMA-M30 (3, 5, 6). The GTI is presently building a system for a further technological development by the Zwickau Engineering College for the use of electromagnetic shaping for the assembly of heat exchangers; this system will be introduced into production in the GDR in 1984.

Other joint investigations among other things relate to the production of metal-ceramics combinations (1, 2), the assembly of stator packages (13), the combination of engine housings with bearing plates for small electric motors (12), the assembly of ignition coils and ventilator impellers (12), as well as the manufacture of powder blanks (7, 8).

GTI has special experience in the use of the electrohydraulic effect for casting cleansing. In this connection, GTI Budapest imported two series-scale systems from the USSR which were adapted to Hungarian conditions and placed in operation. Experts from the corresponding GDR industry branches were informed on the good discoveries made in connection with this method at GTI through publications (7, 8, 15, 16) and during conferences (3, 9), for the purpose of using the experience available in the Hungarian People's Republic in the GDR industry.

If we review the more than 13 years of scientific-technical cooperation between the above-mentioned institutions of the Hungarian People's Republic and the GDR, then we can say that this cooperation achieved a division of tasks to a very great extent, that duplication of development work was avoided, and that the transfer of developed technologies was speeded up.

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GERMAN DEMOCRATIC REPUBLIC

INDUSTRIAL AUTOMATION EQUIPMENT FOR EXPORT DESCRIBED

East Berlin DDR EXPORT: ELEKTROTECHNIK in German Vol 15, 1984, pp 22-25

[Text] Equipments for Machine Tool Automation

Dual Processor Control CNC 646-1

The CNC 646-1, which was developed by the VEB Numerik "Karl Marx"--an organization of the VEB Automated Systems Construction combine, specializing in control systems--is a high-power, dual processor control system based on a microprocessor system. This system can be used with universal or single purpose machine tools for a wide range of tasks in prototype development, small-run production, as well as in large-scale mass production.

The CNC 646-1 permits dispensing with costly tool preset devices and organizational support systems. It permits development of its own data processing with its unique capabilities for simple, process-oriented, on-site programming, program documentation and correction, program input and program exchange. Use of the most up-to-date components guarantees the user maximum utilization of micro-electronic capabilities in this control system.

Advantages of the CNC 646-1 system are:

- possibility of new design through compact construction of control system
- centralized control from keyboard
- drastic reduction of energy consumption
- high reliability through high degree of integration
- continuous supervision of numerous CNC 646-1 functions simple programming
- direct programming of work piece contours
- easy subprogram technology
- teach-in programming
- work piece program memory in form of interchangeable electronic RAM or EPROM cassettes.

Operation and maintenance are simplified through dialog with the control system, based on loading of additional programs. Several new features of the CNC-646-1, compared to existing control systems, were added. Application possibilities were extended considerably by new features such as:

- connection to measuring probe
- Hirth type serration auxiliary axes
- track control for drilling/shaping with NNC axes
- expansion of work place
- expansion of PC memories.

Industrial Robot Control IRS 650

A key product of the VEB Numerik "Karl Marx" is the general-purpose programmable industrial robot control system IRS 650. It can be used for electrically driven, jointed robots, wherever coordinated simultaneous motion of several robot axes is typical. It is possible to control six position controlled axes either simultaneously or individually.

The control system is suitable for parts-handling and for technological processes. Utilization of microprocessor computer technology for control and regulation purposes is the basis for the adaptability of the control mechanism to the process. Programming is based on indirect teach-in methods and on textually developed programs. The control cabinet design includes not only the microprocessor components, but the drive controller for the robot axes and the required power supplies. An especially well-designed control panel permits operation and programming from a technologically most suitable location. All important functions are monitored while the control system is in operation. For installation, operation and maintenance a complete program package is available to the user. The programs are stored on magnetic tape cassettes.

Advantages for the user are:

- modular construction and diagnostic systems simplify operation and maintenance
- monitoring of all key functions
- a video screen is available for dialog with the control system
- programmable subprograms permit optimum utilization
- microelectronics permit high reliability and flexibility

Automated System for Oil Pipeline Station

The economic need for more effective exploitation of oil fields and for efficient processing of the crude oil for the processing industry requires improved technologies. This then increases the need for automation which can realize specialized processing algorithms.

The VEB Instruments and Controller Factory at Teltow, an enterprise of the VEB Automated Systems Construction combine, has developed a special variant of the automated system audatec, for specialized use in crude oil production. For this purpose, a modified set of microprocessors was included in the automated audatec system. The new variant represents an optimum adaptation of the automated system to smaller technological processes.

The oil pipeline stations are operated unmanned. They are operated via data transmission from a central station which may be as far as 100 kms away.

A portable operations panel permits on-site access to the technological process.

Using this variant of the automated system audatec, together with the corresponding technology, achieves the following effects:

- 10 percent increase of production of an oil field
- 2.5 percent savings in natural gas through optimized operation possibility of remote control of widely dispersed stations through a central EDP installation.

GDR Electric Motor Construction Offers Wide Range of Sizes

The VEB Electrical Machine Construction combine offers domestic and foreign manufacturers of machine tools, processing equipment, transportation systems, rail vehicles, a large variety of consumer goods and of many other products drive units ranging in size from a trouser button (micromotors with about .5 watts) up to a one-family home (16 Megawatts). No other manufacturer of electrical motors offers such a broad selection of generally accepted product lines. More than 25 million standard motors, 6 million drive motors, 17 million one-phase motors, 21 million refrigerator motors have so far been delivered--numbers which represent international top values, which are proof of both quality and quantity. Almost 40,000 electric motors leave the production lines during one workday; this amounts to an annual output of, among others, 1.6 million standard motors, 350,000 drive motors, almost 1 million one-phase motors (including over half a million washing machine motors) and more than 1.5 million refrigerator motors; i.e. more than 8 million electrical machines a year.

Among the customers from 90 countries, the USSR is the largest and most important trading partner. Based on long-term trade agreements, the GDR Electro Machine Construction company has delivered to the USSR electrical motors valued at more than M 1.5 billion. This does not include several million motors which were delivered as components of machines and system. Examples are the GDR supertrawlers, which are equipped with VEM [State owned machine construction company] drives; they are well known in the USSR.

600,000 Gear Motors

Gear motors have played an important role among the direct deliveries to the USSR for more than two decades. Altogether 4.5 million pieces have been produced so far; about 14 percent of them were exported to the USSR.

The 50 year anniversary of Maschinoimport coincided with the 20th anniversary of successful cooperation between the GDR Electro Machine Construction company and the Soviet foreign-trade enterprise. At this occasion in 1983 in Moscow, the 600,000th drive motor, which had been delivered to the USSR, was handed over in a festive ceremony. A symposium arranged by the GDR trade representative's office in Moscow on user advantages and application possibilities of drive motors attracted the interest of many experts and journalists.

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CSO: 8120/0573

NEW STATUTE OF ACADEMY OF SCIENCES URGES CLOSER NON-BLOC TIES

Statute Summarized

East Berlin NEUE JUSTIZ in German Vol 38 No 11, 1984, p 457

[Text] The implementation of the economic strategy increasingly calls for the improvement of the efficiency of science and technology including the intensification of research processes. The Statute of the GDR Academy of Sciences of 28 June 1984 (GBI I No 19 p 241), enacted by the Council of Ministers, created an important basis in law for the management of science at the supreme research institution of our country, consonant with these greater demands.

The social status of the Academy as the scientific center of the GDR is characterized by the fact that it encompasses a community of outstanding scholars and efficient research institutions, working mainly in various fields of basic and applied research. At the same time, it is part of the GDR's scientific potential and closely cooperates with other research, development and educational institutions.

On this basis, the statute obligates the Academy to employ its scientific potential in particular as planned for the main orientations of scientific-technical progress and to systematically improve its own capacity for acquiring new perceptions about the laws of nature, technical science, society and the human life process, making available the results of its scientific efforts for the development of all social sectors and carrying out technological research. Together with central state organs and institutions, universities and colleges, combines, enterprises and facilities, as well as local state organs, the Academy is responsible in particular for working for the widespread utilization of the results of its scientific endeavors and their rapid transfer to practice. Jointly with the Ministry for University and Technical School Affairs, it must plan and coordinate specified fields of basic research in natural, mathematical and technical sciences as well as carrying on coordinating functions in some field of social and medical research.

By its legal status the Academy of Sciences is a legal entity and budget organization. It is subordinated to the Council of Ministers, and the chairman of the Council of Ministers decides the powers arising therefrom.

Retained by the statute was the principle, settled in the Decree on the Academy of Sciences of the GDR of 26 September 1972 (GBI II No 58 p 637), according to which the Academy owns all the rights and is charged with all the duties of the former German Academy of Sciences at Berlin, including the rights of its predecessors in interest.

Western Commentary

Bonn INFORMATIONEN in German No 18, 1984 pp 19-20

[Text] A new statute has taken effect for the GDR Academy of Sciences. By comparison with the earlier statute, dating from 1969, the Academy has been further upvalued. The new charter more precisely defines, supplements and expands the Academy's duties and confirms organizational changes which had arisen in the Academy's practice in the past 15 years. Also expanded were the Academy's duties with regard to international scientific cooperation, including the expansion of relations with scientific institutions in noncommunist countries.

The Academy considers itself the successor organization of the Electoral Brandenburg Society of Sciences (founded in 1700). It was reestablished in 1946 on the orders of the Soviet military administration as the "German Academy of Sciences." It was given its present function as the most important GDR scientific facility in the course of the 1970 reorganization of science. Two years later its preeminence was confirmed by the assignment of more tasks and renamed "GDR Academy of Sciences."

At the present time, approximately 20,000 people work in the scientific institutes and facilities of the Academy (subordinated to the GDR Council of Ministers), including 7,000 scholars and researchers. The new statute preserves the strong status of the president of the Academy, who "manages (this institution) according to the principle of one-man management coupled with the collective discussion of basic issues and the extensive cooperation of the members and staff of the Academy." Pharmacologist Werner Scheler, a member of the SED Central Committee, has been president of the Academy since 1979.

He is assisted in the presidium by a first vice president, several other vice presidents, a general secretary, the heads of the most important research sections and other responsible scholars as well as the first secretary of the Academy's SED kreis leadership organization. This 15-strong body has the duty of advising the president with regard to the long-range scientific development and research policy of the Academy.

The new statute reduces the powers of the general secretary, hitherto "first deputy to the president" and who, when necessary, took over the president's duties. These powers are now assigned the first vice president. The currently acting general secretary--since 1972 physicist Claus Grote--is now merely the president's representative "for the development of international science

cooperation" and in charge of supervising the fulfillment of the Academy's international obligations.

Physicist Ulrich Hofmann is the first vice president of the Academy. According to the new statute, he now acts as "the president's permanent deputy" and, in the latter's absence, must take charge of the tasks, powers and duties of the president. At the same time, he is responsible for the coordination of analytical-forecasting work, for planning and the domestic cooperation relations of the Academy.

A new operational body, the committee of the Academy, has now been set up in addition to the presidium. The committee is to advise the president about the drafting and implementation of plans. Over and above most members of the presidium, the chairman of the labor union organization at the Academy and the first secretary of the FDJ kreis leadership organization at the Academy are members of this new committee.

The Duties of the Plenum

The plenum of the Academy is the plenary meeting of the full and corresponding members of the Academy. This body confers on the basic scientific topics of the Academy's work; in addition, the plenum is intended to encourage links among the various fields of science and enact recommendations on basic issues and interdisciplinary problems of scientific development.

This body currently has 153 full and 76 corresponding members. All these members are entitled to participate in the decisions made by the plenum; however, voting rights--for instance the appointment of new members--are reserved to full members. Each full and each corresponding member is also a member of a class which respectively group representatives of one or more fields, and who discuss the basic scientific problems of each special field.

Scholars who are "not GDR nationals" but have earned international distinction by outstanding scientific work, may be elected "external members of the Academy." There also used to be full and corresponding external members who were entitled to participate in all plenum decisions; however, these rights were no longer included in the 1969 statute.

With respect to the external members (at present 132, including 27 FRG scientists), the new statute merely mentions that they "cultivate their ties with the Academy," and that the Academy strengthens its relations with them "by providing information about the Academy's scientific life and by other appropriate means."

Cooperation and Combines

A new article was inserted in the section "cooperation of the Academy within the GDR," dealing with cooperation with central state organs, universities and colleges. The article is devoted to cooperation with combines and enterprises, some of which also carry out research assignments. It says that the Academy "entertains contractually regulated cooperation relations"

with combines, enterprises and other partners," directed, among others, "to the drafting of long-range research and development strategies."

On the other hand, the new charter omits a passage included in the old statute, according to which the Academy must accept from the GDR Research Council, "orientations and proposals" on scientific work. Omission of this provision suggests that the GDR Research Council, instituted in 1965 as an advisory organ, has lost importance.

A new article has been inserted in the chapter "International Cooperation by the Academy." This settles "international relations with scientific institutions in nonsocialist states." The article says that the Academy entertains "relations with scientific institutions in nonsocialist states within the framework of its tasks and on the basis of equality and reciprocal profit," thereby contributing "to the promotion of science and the consolidation of peace." For the purpose of organizing such relations, the Academy is to conclude agreements with scientific institutions in these states.

Official Text

East Berlin GESETZBLATT DER DEUTSCHEN DEMOKRATISCHEN REPUBLIK in German
Part I No 19, 4 Jul 84 pp 241-248

["Statute of the Academy of Sciences of the GDR -- Resolution of the Council of Ministers of 28 June 1984," signed by W. Stoph, chairman, Council of Ministers of the GDR]

[Text] The Academy of Sciences of the GDR is a scientific institution of the German Democratic Republic.

Originating with the Brandenburg Society of Sciences, created by Gottfried Wilhelm Leibniz and founded on 11 July 1700, the Academy of Sciences of the GDR continues to pursue the scientific and humanist traditions of its history and its eminent scholars.

In its capacity as research institution and community of outstanding scholars, the Academy of Sciences of the GDR is responsible for the advancement of basic and applied science, and for the application of new scientific knowledge to the social development of the GDR. By its scientific results and their application in practice, the Academy contributes to the speed-up of scientific-technical progress, the comprehensive strengthening of the German workers' and farmers' state--rooted in the socialist community of nations--, the rise in the material and cultural standard of living of the people in the GDR, the consolidation of peace as well as to understanding among the peoples and their social and cultural advance.

The Academy of Sciences of the GDR organizes its operations on the basis of resolutions by the Socialist Unity Party of Germany and the Government of the German Democratic Republic, the laws and other legal regulations. It carries out the task--established in the Constitution of the GDR--to encourage science, research and education.

I.

Status of the Academy of Sciences of the GDR

Article 1

Social Status

(1) As the scientific center of the GDR, the Academy of Sciences of the GDR (hereinafter designated Academy), comprises a community of outstanding scholars and efficient research facilities, largely engaged in basic and applied research.

(2) The Academy is part and parcel of the GDR's scientific potential and, in conjunction with other research, development and educational facilities, contributes to the further organization of the developed socialist society, the improvement of the national economy's capacity and the scientific penetration of all social measures.

Article 2

Legal Status and Domicile

(1) The Academy is a legal entity and budget organization. Its budget plan is part of the state budget plan.

(2) The Academy is subordinated to the Council of Ministers. The chairman of the Council of Ministers decides the powers arising therefrom.

(3) The Academy owns all the rights and has all the duties of the former German Academy of Sciences at Berlin, including the rights of its predecessors in title.

(4) The Academy keeps an official seal and a traditional seal.

(5) The Academy is domiciled in Berlin, the GDR capital.

II.

The Tasks of the Academy

Article 3

Scientific and Scientific Policy Tasks

(1) The Academy has the task of further developing science by performance at high scientific standards and with the greatest possible social efficacy, and by the creation of the scientific prerequisites, to cooperate in the organization of the developed socialist society in the GDR. It uses its scientific potential as planned for the main trends of scientific and technical progress and ensures the systematic improvement of its capacity.

(2) The Academy carries on research with the aim of gaining new perceptions on the laws of nature, technology, society and human life, developing new research methods and making available the results of its scientific efforts for the development of the socialist society, the national economy, education, culture and health care in the GDR, and the security of socialist achievements. The Academy carries on technological research to create and further develop technologies.

(3) Together with central state organs, combines and institutions, the Academy works for the broad utilization of the results of its scientific efforts and their rapid transfer to practice, in particular production.

(4) On the basis of planned analytical-prognostic studies and in cooperation with the State Planning Commission, the Ministry for Science and Technology and other central state organs, the Academy drafts recommendations for the development of specific fields in science and technology and for long-range research objectives as well as appraisals of the social effects of scientific and technical progress. It involves itself in the drafting of long-range development strategies for the national economy.

(5) Together with the Ministry for University and Technical School Affairs, the Academy plans and coordinates specified fields of basic research in the natural sciences, mathematics and engineering. It exercises coordinating functions in certain fields of sociological and medical research.

(6) The Academy encourages scientific and cultural life in the GDR, the creative application and propagation of a scientific ideology, Marxism-Leninism, and the education of the people of the GDR. It guards and nurtures progressive humanist traditions in science, technology, education and culture.

(7) In order to carry out its tasks, the Academy maintains international relations. It coordinates international cooperation with the Academies of Sciences of the USSR and other socialist states in the field of basic research into natural sciences, mathematics, engineering and medicine as well as sociological research.

(8) The Academy contributes to the expansion of the international fund of scientific knowledge; it systematically utilizes this fund within the scope of its operations.

Article 4

Cadre Policy Tasks

(1) The Academy is responsible for the development and selection of eminent and internationally renowned research personalities.

(2) In the selection, development and employment of its personnel, the Academy implements the principles of socialist cadre policy. It looks after the technical and politico-ideological further education of the personnel, encourages their creative capacity and safeguards the training of a young, creative scientific generation.

(3) The Academy combines the planning and implementation of its research tasks with planned cadre development and encourages postgraduate studies by its scientific personnel. A candidacy in science is in being at the Academy.

(4) The Academy cooperates in the training and education of students and the young generation of scientists at the universities and colleges. It participates in the training of personnel from other social sectors.

Article 5

Tasks of Supplies for Research

(1) To enable it to accomplish its tasks, the Academy has a material-technical base which is being developed consonant with the requirements of research and with social possibilities. It encourages the development and manufacture of scientific devices and rationalization aids for research and safeguards the rational use of the manpower, material and financial resources and funds made available to it as planned.

(2) The Academy takes care of the availability of scientific literature and other sources of scientific information. To do so, it uses the international resources of science and involves itself in the internal and international exchange of scientific data.

Article 6

Planning

(1) The Academy arrives at its tasks from the study of basic social needs, the economic reproduction conditions, and the standard and trends of development of science. It plans its tasks and the money and funds required for them as per the legal regulations on the planning of the national economy and the state budget and as per the provisions on the planning of sociological research. It ensures the unity of research and fund planning, the intensive utilization of the research potential and the development of international socialist scientific cooperation, coordinated with its plans.

(2) In joint conceptual work with the State Planning Commission, the Ministry for Sciences and Technology and other central state organs, the Academy cooperates in the preparation of assignments of the state plan science and technology. It guarantees the priority accomplishment of the tasks assigned it by this plan.

III.

Cooperation of the Academy within the GDR

Article 7

Cooperation with Ministries and Central Institutions

In the accomplishment of its tasks, the Academy collaborates with the ministries and other central state organs. The Academy's cooperation with central institutions and scientific academies has as its main objective the guarantee of the coordinated preparation and efficient realization of comprehensive research projects and other scientific tasks as well as the broad application of research results.

Article 8

Cooperation with Universities and Colleges

The Academy cooperates in the realization of the unity of research, training and further education. It closely collaborates with the Ministry for University and Technical School Affairs, the universities and colleges, and assists instruction, education, training and further education, encourages efficient research and ensures reciprocal support in the utilization of the material resources and data funds.

Article 9

Cooperation with Combines, Enterprises and Facilities

The Academy provides an effective contribution to the development of the national economy's output and entertains contractually settled cooperation relations with state-owned combines, enterprises and other partners. These cooperation relations concern the drafting of long-range research and development strategies and the intensification of the reproduction process, in particular the creation and utilization of fundamental scientific results for the development of products, technologies and processes. They also serve the development of socialist community work and the expansion of the partners' research and development potentials. These cooperation relations must be used to improve the economic efficacy of the research and revenues of the Academy.

Article 10

Cooperation with Local State Organs

The Academy's cooperation with local state organs has the objective of making sure that the Academy's development responds to regional conditions, to provide Academy contributions to the development of the scientific and cultural life in the regions, and to encourage regional rationalization.

IV.

International Cooperation by the Academy

Article 11

Principles of International Cooperation

The Academy's international relations serve the accomplishment of the tasks assigned it and the advance of science. They are organized in coordination with GDR foreign policy and state decisions as well as on the basis of the respective international treaties. Cooperation with partners in the USSR and other socialist states is being further developed as planned and enjoys special encouragement; it serves the realization of the tasks of socialist economic integration by the CEMA member countries.

Article 12

International Socialist Science Cooperation

(1) The scientific cooperation of the Academy with the academies of science of the USSR and other socialist states has the objective, by the processing of common tasks to contribute to the speed-up of scientific and technical advancement and the broad social utilization of the results of research. The Academy concludes agreements to that effect with the academies of sciences of these states.

(2) The Academy participates in scientific cooperation within CEMA.

Article 13

International Relations with Scientific Institutions in Nonsocialist States

Within the scope of its tasks and on the basis of equality and mutual benefit, the Academy maintains relations with scientific institutions in nonsocialist states and thereby contributes to the promotion of science and the consolidation of peace. The Academy concludes agreements with scientific institutions in these countries with respect to the organization of such relations.

Article 14

Relations with Interstate and Private International Organizations

(1) The Academy assists the competent GDR ministries and other central state organs and institutions with regard to GDR membership obligations in international interstate organizations. It provides scientific contributions and sends out scholars to work in these organizations.

(2) In some fields, the Academy represents GDR science in private international scientific organizations. It is authorized to become a member of such organizations and observe the duties and rights related thereto. The Academy may establish GDR national committees to carry out the coordinating functions arising from membership in private international organizations.

Article 15

Involvement in International Research Facilities and Enterprises

(1) The Academy takes part in the establishment and operation of international research facilities. It is entitled to become a member of such facilities and observe the duties and rights involved therein.

(2) To accomplish its tasks, the Academy maintains its own research ships and other plant for scientific oceanography. It participates in international scientific expeditions and enterprises.

V.

Members and Staffs of the Academy

Article 16

General Principles for the Work of Members of the Academy

(1) The Academy has full, corresponding and external members. Eligible as members of the Academy are scholars who have contributed significant scientific achievements to the advancement of science, the consolidation of peace and social progress.

(2) Members of the Council of Ministers and full members of the Academy may submit recommendations for the election of new members of the Academy to the president of the Academy.

(3) Members of the Academy are elected by the plenary session of the Academy; election requires confirmation by the chairman of the Council of Ministers.

(4) Membership of the Academy may be terminated by the decision of the plenary session, if the prerequisites for membership have ceased to exist, or if the respective member of the Academy has committed a gross infraction of membership duties. The termination of membership requires confirmation by the chairman of the Council of Ministers.

Article 17

Full and Corresponding Members of the Academy

(1) Elected full and corresponding members of the Academy may be nationals of the GDR, who have enriched science and technology by eminent performances and results, exerted decisive influence on their utilization in social practice and thereby earned great merit as regards the advance of science in the GDR. Their membership in the Academy is linked with the appreciation and active cooperation in the accomplishment of the Academy's social assignment stipulated in this statute.

(2) Full and corresponding members of the Academy are obligated to share in the work of the Academy and provide scientific contributions to the accomplishment of the Academy's assignments, regularly attend meetings of the Plenum and the classes, and to participate in their work by scientific lectures and in other ways. They follow the standard and trends of development in their science and related fields and derive therefrom recommendations for the deepening of the respective scientific discipline. Full and corresponding members receive an allowance for their work at the Academy.

(3) Full members are authorized to vote in accordance with the provisions of this statute, to participate in decisionmaking in the plenary session, to claim the title "full member of the Academy of Sciences of the GDR" and to wear the decorative pin of the Academy.

(4) Corresponding members are entitled to participate in decisionmaking in the plenary session, to claim the title "corresponding member of the Academy of Sciences of the GDR" and to wear the decorative pin of the Academy.

(5) The fulfillment of the obligations arising from the membership of full and corresponding members of the Academy is deemed work within the scope of the labor code relationship of the respective member.

(6) Full membership up to age 65 (60 for women) is not to exceed 90. The total of corresponding members is not to exceed 100.

Article 18

The External Members of the Academy

(1) Scholars who are not nationals of the GDR may be elected external members of the Academy, if they have earned internationally renowned merit for the advancement of science and technology by virtue of their outstanding scholarly performances. External members acknowledge the basic humanist concerns of the Academy stipulated in this statute.

(2) The Academy strengthens its relations with external members by providing information about the scholarly life of the Academy and in other suitable ways.

(3) External members nurture their connection with the Academy. They are entitled to claim the title "external member of the Academy of Sciences of the GDR" and to wear the decorative pin of the Academy.

Article 19

The Personnel of the Academy

(1) The work of the Academy personnel involves special duties due to the status and the tasks of the Academy in the socialist society; it represents great social prestige. By their personalities, skills and performances, the personnel of the Academy must guarantee that they will conscientiously carry out the tasks assigned them, effectively contribute to the accomplishment of the Academy's social assignment and coordinate their entire behavior with the responsibility held by the Academy.

(2) The personnel of the Academy are obligated by their initiative, creativity and readiness to perform and assume risks, to promote the scholarly work of the Academy, in particular its research, to participate in the transfer of research results to social practice, and to contribute to the improvement of the Academy's social efficacy and its reputation. They cooperate in the Academy's management and planning operations.

VI.

The Structure of the Academy

Article 20

The Plenum

(1) The Plenum of the Academy is the plenary session of the Academy's full and corresponding members. At the invitation of the chairman, guests may attend the discussions of the plenum.

(2) The plenum discusses fundamental scholarly problems arising from the general advance of knowledge, the greater sophistication and integration of the sciences and the use of science in social practice. The plenum encourages links between the scientific disciplines. It contributes to the encouragement and organization of science, technology, education, culture and health care in the developed socialist society and to the nurturing of progressive traditions in science. The plenum ascertains trends in scientific development and assists the elucidation of cross-sectional problems. It issues recommendations on basic issues and interdisciplinary problems of scientific development and deals with lectures by Academy members on their own research. The plenum encourages scientific and cultural life in the GDR as well as the spread, popularization and utilization of new scientific findings. The results of the discussions at plenary sessions are published in a suitable form.

(3) The plenum elects new full, corresponding members and external members of the Academy and issues recommendations for the appointment of the president, vice presidents and general secretary of the Academy. The plenum also decides the termination of membership in the Academy.

(4) The plenum decides the Award of Distinction by the Academy. The plenum is informed of the proposed appointment of scientific employees as professors.

(5) The full members of the Academy have the right to vote in the plenum.

(6) Elections and decisions as per Paragraph 3 are conducted and completed by a simple majority of the full members attending the plenum. Elections take place only if more than half the full members are present at the plenary meeting. Full members who are prevented from attending the election session may exercise their right to vote by mail; they are deemed to be present at the election session.

(7) Resolutions as per Paragraph 4 are adopted by a simple majority of the full and corresponding members attending the plenary session. The plenum is deemed to have a quorum if more than half the members are present. Full and corresponding members who are prevented from attending the respective session may exercise their voting rights by mail; they are deemed to be present at the respective session.

Article 21

The Classes

(1) The classes of the Academy are working bodies composed of the full and corresponding members of one more more scientific disciplines.

(2) Each full and corresponding member belongs to one class. The work of each class is directed by the class chairman, one of its full members. On the recommendation of their classes, the president of the Academy appoints the class chairman for 4 years; they are responsible to him for the work of the classes. Guests may attend class discussions at the invitation of the chairman.

(3) The classes discuss basic issues involving the development of their disciplines and the adjoining scientific disciplines as well as interdisciplinary relations. The classes contribute to the deepening of scientific theory in the respective disciplines and to interdisciplinary linkage. They draft recommendations on the selection and promotion of important research assignments and methods, and to the social utilization of scientific results. The classes deal with proposals regarding the election of new members of the Academy and with scholarly reports by their members.

(4) Each class cultivates links with the other classes of the Academy, the scientific councils and societies attached to the Academy and to scientific advisory bodies of other social sectors. The classes help research departments and institutes to carry out their tasks. The working results of the classes are published in a suitable form.

Article 22

Research Sectors

- (1) Combined in research sectors are institutes which carry on research in the same or related scientific fields.
- (2) Research sectors draft long-range strategic bases for their fields and coordinate research in these fields within the Academy and with the social sectors affected. Consonant with the principles of socialist intensification, they develop the capacity, standard of output and social efficacy of research at their institutes and endeavor to ensure that research results are made available as per plan and in response to the needs and conditions of social development, and that they are transferred to social practice. The research sectors direct the domestic cooperation relations and the international cooperation of the institutes merged in them.
- (3) Research sectors are established, reorganized or dissolved for reasons of the scientific division of labor and in response to long-term social and scientific demands on the organization of the Academy's research potential. The Council of Ministers decides the establishment and dissolution of research sectors.

Article 23

The Institutes

- (1) The central institutes, institutes, research agencies and other scientific and scientific-technical facilities of the Academy (collectively called institutes) are the research agencies of the Academy, where staff collectives collaborate in the fulfillment of plan tasks. They implement the unity of theory and practice in science in the course of working on research tasks, development research methods and using the results of research.
- (2) The institutes carry out conceptual work in preparation of their research tasks and carry on research with the aim of providing outstanding scientific results and top performances. They safeguard the comprehensive protection of their research results and, jointly with their cooperation partners, transfer them to social practice.
- (3) For the preparation and accomplishment of their tasks, the institutes maintain cooperation relations with other Academy institutes and facilities as well as with state-owned combines, enterprises and other partners in the GDR. The institutes develop their international cooperation primarily with partners in the USSR and other socialist states; they encourage the foreign trade utilization of their scientific-technical and other output and results.
- (4) Institutes are established, reorganized or dissolved in response to long-range social and scientific needs. The assignments, structure and method of operation of the institutes are prescribed in institute codes.

Article 24

The Service Facilities

(1) The service facilities of the Academy are facilities for research supplies, which contribute to the rationalization of research in territorially neighboring institutes by concentrating on procurement.

(2) The provision of Article 23 Paragraph 4 applies *mutatis mutandi* to the establishment, reorganization and dissolution of service facilities. The assignments, structure and method of operation of service facilities are prescribed in codes.

Article 25

The Scholarly Societies

Scholarly societies which have their own legal entity, are attached to the Academy. The Academy directs the scholarly societies in the drafting of their objectives, advises them on issues of science policy and supervises the observance of their statutes.

VII.

Management of the Academy

Article 26

The President

(1) The president directs the Academy on the principle of one-man management combined with the collective discussion of fundamental issues and the comprehensive collaboration of members and staffs of the Academy. He is responsible to the Council of Ministers for the achievement of the objectives and tasks of the Academy. The president is subordinated to the chairman of the Council of Ministers and reports to him.

(2) The president directs the work of the presidium and the council, and he chairs the plenary sessions of the Academy. The president is in charge of the planned development of the work of the Academy's classes. On the basis of presidium resolutions, he decides on the establishment and dissolution of institutes and facilities, classes and scholarly councils at the Academy. The establishment and dissolution of scientific institutes requires confirmation by the presidium of the Council of Ministers.

(3) Following collective discussions by the presidium or the plenum of the Academy, the president makes the provisions necessary for the development and organization of research and scientific life; he decides the long-range objectives and tasks for the work of the Academy. He makes sure that socialist cadre and educational policy is carried out at the Academy and safeguards the planned development of working and living conditions.

In collaboration with the plenum, the president provides for the development of the Academy's membership consonant with scientific and social circumstances.

(4) The chairman of the Council of Ministers appoints the president for a 4-year term. The plenum of the Academy submits recommendations to the chairman of the Council of Ministers for the appointment of the president.

Article 27

The Presidium

(1) The presidium of the Academy discusses the preparation of fundamental decisions to be made by the president with regard to the long-range scientific development and research strategy of the Academy as well as the organization of scholarly life at the Academy and the work of its scholarly bodies, research sectors and institutes. The presidium discusses the recommendations of the Academy on GDR scientific strategy, the preparation of conferences and recommendations of the plenum and the development of the Academy's international relations. It adopts resolutions on the draft of the comprehensive plan of the Academy and the establishment and dissolution of institutes and facilities, classes and scholarly councils of the Academy.

(2) The presidium exercises the function of a scientific advisory council for the award of academic degrees in accordance with legal regulations.

(3) The presidium is composed of the president, vice presidents, general secretary, managers of the research sectors, chairmen of classes, secretary of the presidium and other persons appointed by the president.

(4) The first secretary of the SED kreis leadership organization at the Academy is a member of the presidium.

(5) Membership of the presidium is not transferrable.

Article 28

The Council

(1) The council of the Academy is the advisory body of the president for the preparation of presidential decisions on the drafting of Academy plans, the safeguarding of plan implementation, the supervision of plan fulfillment and reporting thereon as well as the development of the cadre potential, the organization of domestic and international cooperation relations of the Academy and measures for the enforcement of socialist law.

(2) The council is composed of the president, vice presidents, general secretary, managers of research sectors, secretary of the presidium and directors of special spheres of responsibility.

(3) The first secretary of the SED kreis leadership organization at the Academy is a member of the council.

(4) The chairman of the kreis executive board of the Science Trade Union at the Academy and the first secretary of the FDJ kreis leadership organization at the Academy are members of the council.

(5) Membership of the council is not transferable; in case of unavoidable absence, members of the council may send a delegate in their place.

Article 29

The Vice Presidents and the General Secretary

(1) Vice presidents and the general secretary assist the president of the Academy in the exercise of his management functions.

(2) The first vice president of the Academy is the permanent deputy to the president. In the absence of the president, he takes over his tasks, powers and duties. As the president's representative, the first vice president is also responsible for the coordination of analytical-prognostic work, planning and the domestic cooperation relations of the Academy.

(3) In his capacity as representative of the president, the general secretary is responsible for the development of international socialist scientific cooperation and the other international relations of the Academy in coordination with GDR foreign policy, state decisions and international treaties. He supervises the fulfillment of the Academy's international obligations.

(4) As the representative of the president, one vice president is responsible for the sector of social sciences and its planned development consonant with the resolutions of the Socialist Unity Party of Germany.

(5) As the representative of the president, one vice president is responsible for issues involving scholarly life and the scholarly societies, for the publishing operations of the Academy and the encouragement of the young generation of scientists.

(6) Yet another vice president may handle other spheres of responsibility, which requires the president to be represented. The Council of Ministers decides this point.

(7) The president of the Saxon Academy of Sciences at Leipzig is an ex officio vice president of the Academy.

(8) The chairman of the Council of Ministers appoints the vice presidents and the general secretary for 4-year terms. The Plenum of the Academy submits the appropriate recommendations to the chairman of the Council of Ministers.

Article 30

The Managers of the Research Sectors

- (1) The managers of the Academy's research sectors are appointees of the president and represent him with regard to the coordination and supervision of research in various fields of science and the uniform management and planned development of the institutes and facilities merged in the research sectors. They manage the research sector on the principle of one-man management and collective discussion. The managers of the research sectors are responsible to the president of the Academy for the accomplishment of the tasks assigned the research sectors and must report to him.
- (2) The managers of the research sectors guarantee the achievement of the research strategic objectives, the drafting and defense of the plans of the institutes subordinated to the research sectors, the concentrated and rational deployment of research capacities, the selection and distribution of cadres consonant with the principles of socialist cadre policy and the needs of research, as well as supervision of plan fulfillment; they receive the reports of the directors of the institutes.
- (3) In the discharge of their duties, the managers of the research sectors rely on scientific advisory councils. They ensure their cooperation with the classes of the Academy and other scholarly bodies as well as the scholarly societies attached to the Academy. On the recommendation of the manager of the respective research sector, the president decides the composition of the scientific advisory councils. The managers of the research sectors are assisted by deputies in the exercise of their management functions.
- (4) The president appoints the managers of the research sectors and their deputies for a term of 4 years.

Article 31

The Directors of the Institutes

- (1) The directors of the institutes of the Academy manage the institutes on the principle of one-man management and collective discussion. They are responsible to the president and managers of the competent research sectors for the fulfillment of the tasks assigned the institutes and must report to them.
- (2) The directors of the institutes guarantee the analytic-conceptual preparation of scientific tasks and their planning, the fulfillment of plans with outstanding scientific results and top performances, the utilization of the capacities available to the institute in accordance with the needs of socialist intensification as well as the development and training of the personnel consonant with the principles of socialist cadre policy and the efficient deployment of the personnel.

(3) In the accomplishment of their tasks, the directors of the institutes are assisted by scientific advisory councils. The manager of the competent research sectors decides the composition of the scientific advisory councils at the recommendation of the director concerned. The directors are assisted by deputies in the exercise of their management functions.

(4) On the recommendation of the manager of the competent research sector, the president of the Academy appoints the directors of the institutes for a 4-year term. On the recommendation of the director of the respective institute, the manager of the competent research sector appoints the deputies to the directors, also for a 4-year term.

(5) The provisions of Paragraphs 1-4 apply mutatis mutandi to the directors of other Academy facilities.

VIII.

Rights of the Academy

Article 32

Award of Academic Degrees

(1) Consonant with the fields of science represented in it, the Academy awards the academic degrees

--"Doctor of a branch of science"

--"Doctor of Sciences".

(2) The Academy awards academic degrees as per the legal regulations issued to that effect.

Article 33

Appointment of Professors

(1) The Academy is entitled to designate professors the scientific employees of the Academy, who have produced important achievements with regard to research and the application of research results in social practice, and have demonstrated their ability to train and educate the young generation of scientists and to direct collectives.

(2) The designation "professor" is awarded by the president of the Academy as per the procedural system enacted in coordination with the Minister for University and Technical School Affairs.

Article 34

Award of Distinctions by the Academy

(1) The Academy awards

- The honorific clasp of the GDR Academy of Sciences in appreciation of exceptional merit in the promotion of the sciences, the mobilization of their results for the preservation and consolidation in international peace and the social progress of mankind;
- The Helmholtz Medal of the GDR Academy of Sciences and the Friedrich-Engels Prize of the GDR Academy of Sciences in appreciation of preeminent scientific achievements;
- The Leibniz Medal of the GDR Academy of Sciences for significant scientific achievements with great social or economic impact;
- The Johannes Stroux Medal of the GDR Academy of Sciences in recognition of many years of exemplary achievements in the fulfillment of Academy assignments; and
- Distinctions for outstanding achievements in various disciplines, by which an important contribution is made to the organization of the developed socialist society in the GDR.

(2) The president of the Academy awards the distinctions as per Paragraph 1 consonant with the regulations established in this connection.

Article 35

Publications

(1) The Academy publishes reports on the results of its scientific studies and research, the discussion of the plenum, the classes and other scholarly bodies and the science events conducted by it as well as on its operations as a scientific institution of the GDR. The research sectors and institutes of the Academy are entitled to publish series, sequels and periodicals. The president of the Academy decides the kind and size of the publications of the Academy and its facilities and bodies.

(2) The Academy is entitled to have its publications issued by its own publishing house. The Akademie-Verlag Berlin and state-owned printing plants are subordinated to it.

(3) Publications by full and corresponding members and employees of the Academy must be of a standard in accord with the high social status and responsibility of the GDR Academy of Sciences, promote the reputation of the GDR and the Academy and observe the need for protecting the socialist society, scientific work and its results from injury. Employee publications having to do with their work at the Academy are subject to approval.

Article 36

Events

- (1) In order to carry out its scientific and science-policy tasks, the Academy conducts conferences, meetings and other scientific events of a domestic or international nature.
- (2) In honor of Karl Marx, the Karl-Marx lecture is offered each May as a special scientific event organized by the Academy.
- (3) In honor of the Academy's founder, a Leibniz Day is arranged each July as a festive assembly of the Academy. This assembly serves the public, reporting on the work of the Academy and the introduction of the newly-elected members of the Academy; a special scientific lecture is included in the proceedings.
- (4) Academy distinctions are awarded within the framework of the Karl-Marx lecture and the Leibniz Day.

Article 37

Record Keeping and Preservation of Cultural Heritage

- (1) The Academy collects and maintains cultural and documentary records relating to the development of science and technology and the history of the Academy.
- (2) The Academy has at its disposal central archives which, within the framework of central record keeping, are competent as the final archives for all the records of the Academy. They are entitled to accept and preserve materials inherited from members of the Academy and other personalities of scientific and cultural life.

Article 38

Foundations and Endowments

Attached to the Academy are foundations and endowments which are competent to contract, though not legal personalities. The Academy is authorized to accept and administer endowments for scholarly purposes.

IX.

Representatives of the Academy in Legal Affairs

Article 39

General Principles

- (1) The president represents the Academy in legal affairs, the first vice president does so in the absence of the president.
- (2) The vice presidents, general secretary and managers of the research sectors are authorized to represent the Academy in legal affairs within the sphere of their responsibilities.
- (3) The directors of the institutes and facilities of the Academy are authorized to represent the Academy in order to accomplish the tasks assigned in the institute regulations and within the scope of the institute plans.
- (4) Other managers and employees of the Academy or other persons may be authorized to represent the Academy in legal affairs. Authorization must be issued in writing.

Article 40

Special Provision for Representation in International Affairs

- (1) The president or general secretary alone represent the Academy in international affairs.
- (2) Other managers and employees of the Academy or persons are authorized to represent the Academy in international affairs only if they have been issued the relevant authority by the president or general secretary. Authorizations must be issued in writing.

X.

Implementing and Concluding Provisions

Article 41

Standing Orders and Rules for Special Fields

- (1) In order to carry out this statute, the president issues the standing orders of the Academy.
- (2) The president issues instructions and rules for the normative regulations required to carry out and use legal regulations in the sphere of the Academy and for the efficient organization of operational processes.

Article 42

Concluding Provisions

(1) Complementations, amendments and the cancellation of this statute require a resolution by the Council of Ministers.

(2) This statute takes effect on 1 July 1984.

(3) Losing effect at the same time are:

- The Decree of 20 May 1969 on the Statute of the German Academy of Sciences at Berlin (GBI II No 49 p 317);
- The Decree of 26 September 1972 on the Academy of Sciences of the GDR (GBI II No 58 p 673).

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CSO: 2302/42

GERMAN DEMOCRATIC REPUBLIC

ESER STATUS REPORT ALLUDES TO RYAD III DEVELOPMENT

East Berlin RECHENTECHNIK-DATENVERARBEITUNG in German Vol 21 No 10, Oct 84
(signed to press 21 Aug 84) pp 5-8

[Article by Dr. Hang-Georg Jungnickel, Chief Design Engineer for ESER
(Unified System of Electronic Computers) of the GDR]

[Text] The Work at the ESER

The growth of our republic's economy is closely linked to joint developments on the part of all the countries of the socialist community of states. These developments are characterized by their systematic character and by continuity. The growth of electronic data processing, in being an important instrument of rationalization in many sectors of the economy, can be viewed as virtually a model of this developmental process. For the 35th anniversary of our republic we are striking a good balance also in the sector of computer engineering, with this process being closely connected with the 15 years of existence of ESER.

The initial decision of the Council of Ministers on the development of computer engineering in our republic was made some 20 years ago. At that time the key element in this was the development, production, and purposive use of Robotron 300, the first electronic data processing system developed in the GDR. This step, which today is already a historical one, was needed in order to make rapid headway in such a sector, which is so important for economic development, and thereby to become as independent as possible from discriminatory measures by capitalist states by way of their embargo decisions.

The rapid pace of developments in computer engineering and the efforts of all the socialist countries in this sector led to the situation where by 1970 more than 30 different types of computers existed, which were not compatible with one another and which for the most part had an inadequate program support, and this handicapped their use. Whereas in the GDR there were already computers of the type ZRA 1, Robotron 100, and Robotron 300, among others, in the USSR there were the URAL and Minsk series, the M-line, the BESM computers, and a number of other types. In the Polish People's Republic there were the ELWRO computers, and such an enumeration could be continued further.

But aside from the USSR, the other countries did not have the capability to handle alone over its entire range the sector of electronic computer engineering, which meanwhile had been growing. Logically enough, this situation led to the signing, some 15 years ago now, in December 1969, of the "Multilateral Agreement on Cooperation by the Socialist Countries in the Sector of Computer Engineering" by the governments of the GDR, USSR, People's Republic of Bulgaria, Hungarian People's Republic, the Polish People's Republic, the CSSR, and later by the Socialist Republic of Romania. This resulted in a form of close scientific-technical and economic cooperation unknown up to that time. At first the principal concern was work on an entire gamut of hardware and programming resources, which was directed toward all-purpose data processing tasks and which encompassed a broad variety of performance capabilities extending as far as large electronic data processing systems.

This work is guided by a Multilateral Government Commission (MRK). There are working groups for the various fields of activity, with the Council of Chief Design Engineers of ESER (RCK ESER) heading the technical and system-program development as well as the corresponding preliminary work for the above-mentioned comprehensive program for all-purpose electronic data processing equipment.

Great attention was and is paid to the establishment of technical customer service organizations in the countries participating in the agreement. After going through a number of stages, these evolved into the present mode of operation as a Council for Technical Customer Service. From the very beginning great importance was also attached to applications, since it is here that the practical effect of computer engineering is decisive. That is the sphere of operations of the Council for Application Technology.

The Economic Council occupies a special position within the framework of the MRK. In this, the representatives of the planning commissions discuss questions of a basic economic strategy of balanced interdependence on the basis of coordinated guideline prices, and they adopt other long-range coordination measures. The most striking result of this is a multilateral specialization agreement ratified in 1980, which since then has substantially determined the lines of work taken by the various countries, including also the work of those specialist sections of the RCK ESER in which the technical conceptions for the different devices are discussed and coordinated.

Through the joint work at the ESER and the work of the other MRK organs, a unified system of electronic computer engineering has been produced which represents a convincing example of cooperation beyond country borders.

Meanwhile, Series 1 of the ESER computers has already become history. With this, it proved possible to gain valuable experience also in the organization of the work. Series 2 of the ESER computers is in production, and the transition to the next series along with its peripheral equipment is in full swing in the various countries. The first models have already been presented to the commissions for joint tests. The joint tests signify the conclusion of the developmental work for each device or programming system

belonging to ESER, and thus are a high point for the developer country. For a relatively long time now, preliminary work on follow-on systems has been under way as well, and initial ideas on taking the next steps for further developments and for completely new approaches to solutions have been focused on.

Starting with its existing capability and experiences, from the very beginning the GDR has been participating actively in the work of the ESER. This has resulted in substantial contributions, which at all stages and in many sectors have had their repercussions and appropriate recognition--even including the conferring of high governmental distinctions. These results were clearly seen at the ESER exhibitions organized in 1973 and 1979 by the coordination center in Moscow, at which the GDR was present with representative offerings.

All these results were and are an expression of socialist economic integration, an expression of everyday hard work for the highest performance and quality standards, and an expression of the consistent implementation of the principle of preparing for and realizing all tasks under the leadership of our USSR partners and in precise coordination with them.

Contributions to the Designing and Development of the Model Series

Architectural and Performance Designing

Corresponding to the level reached internationally in the development and use of methods of all-purpose data processing technology, in the beginning phase of the work at ESER (1968/69) it was important to determine and to coordinate functional and performance characteristics as well as the basis for realizing a series of models. It was assumed that the concept for a model would include the three main components of central processor unit, peripheral devices, and program support, since it is only through the interaction of these that an application becomes possible. The basic requirements for the model series were:

- Unified interface between the machine functions in all models and the machine-oriented program systems (operating systems, diagnostic routines),
- unified interface between the channels of the central processing units and the control units of the peripheral devices,
- a gradation of integrated performance in all three main components of the models, and a balanced development among the subcomponents.

With these requirements, consideration was to be given equally to the fundamental needs:

- of users for a flexible hardware outfitting of the models and for the ability to exchange components depending on the conditions of procurement and operation,

- and of the developer countries for a determination of their contributions, based on a division of labor, in accordance with their economic opportunities and objectives.

In the following period this architectural and performance designing for the ESER Series 1 proved to be a solid basis for further evolutionary developments up to the present.

Both among the models of a single series and also among the model series themselves, common features but also differences are of importance to the application of data processing. This concerns primarily central processing units and operating systems, whose functional interaction at the interface is specified by the operating principles, and which jointly determine for the user the level of application. Common features in these models are:

- A basic instruction set for the central processing and control functions,
- a basic command set and standard interface signals and signal sequences for controlling input/output,
- basic mechanisms of interrupt, privileged operation, and error handling for controlling the program run,
- a decision in favor of all-purpose use in all sectors of the national economy (refraining from developing special and supercomputers).

With respect to the first three common features, functional expansions and throughput-accelerating measures are being realized to the greatest possible extent in such a way that the use of existing programs and peripheral devices can continue to be assured (upward compatibility). Differences in the models are:

- How they are outfitted with all-purpose hardware and software components, as well as their performance parameters,
- how they are equipped with specialized modules or processors for increasing performance in special areas of application,
- technical devices for guaranteeing machine functions and for communication between person and model.

These differences reflect the corresponding stage of development of the models and are characteristic of the diverse uses of such models.

The design work outlined above was shaped to a substantial degree with the help of specialists in the GDR who have been active in the corresponding bodies since 1968. Above all in the initial phase of ESER, they had to attend to not only economic interests of our republic but also fundamental tasks involved in establishing the system architecture for the entire ESER. Their focal points in terms of subject matter were:

- Operational principles and standard input/output interface for the model series,
- technical requirements and objectives for the model series, especially for the central processing units,
- operating systems and diagnostic routines for the model series.

Within the framework of the community of all the countries participating in the ESER, the bilateral coordinating conferences between the USSR and the GDR proved to be the most common and most effective form of cooperation.

ESER Models from the GDR

In connection with Series 1, our country introduced the model EC 1040. Development was completed in 1972. At first planned as the third-largest and intermediate model of this series, the EC1040 proved to be one of the leading models because of its comprehensive performance characteristics and its scale of production. This model was in great demand in most of the ESER countries, above all in the USSR. All in all, 380 specimens of this type were produced, and of these 177 were exported. Building on the circuitry base and core storage technology provided by the GDR as well as on modern technological concepts for printed circuit board, wiring, and soldering techniques, subtle algorithms and structures plus a comparatively high main storage capacity (15-20 times that of the predecessors Robotron 300 and Robotron 21 in the GDR) ensured a noteworthy performance in the central processing unit.

Aside from the central processing unit EC2640 and the query station EC7073 for communication between the operator and system, complemented by a variety of domestic and foreign ESER peripheral devices, the operating systems DOS/ES and OS/ES (up to version 4) as well as the system of autonomous diagnostic routines, as an important component of the diagnostic system, were characteristic of the model inventory for the EC1040.

Primary areas of application for this model were and are computer centers in governmental, industrial, and academic institutions, in which numerous complex data processing problems of a scientific-technical and economic nature arise, and where the powers of the multiprogram operation of the EC1040 can be fully exploited.

Corresponding to the basic requirements of continuity and compatibility, which are essential to the ESER generally in the interests of the users of computer equipment, the GDR also made its contribution to Model Series 2 of the ESER with its model EC1055, whose development was completed in 1978. Although the technologically restricted basic speed could not be increased substantially, this model as well profited from the advantages inherent in the EC1040, and likewise became a success for our country. Some 150 copies were produced, of which 129 were exported. In addition to a number of technical improvements in the central processing unit EC2655, also noteworthy are the following enhancements and expansions:

- Doubling of the machinery's main storage capacity to 2 megabytes,
- introduction of the virtual memory concept, with this making available a 16-megabyte addressing area in the main memory for the users,
- integration of the means of communication for operator-system and operator-machine (central processing unit) into the operating unit EC7069,
- operating system input/output, version 6, with support from a virtual memory, and later (1982) the operating system SVM/ES for operating virtual machines.

With these and with other devices (for example, channel-channel adapter), new areas of use have been opened up in which multimachine and remote data processing systems play a role.

Starting with model EC1055, it proved possible to create a modernized model EC1055.M with a number of functional and technical enhancements, by means of which the latest research and development results were rapidly translated into production. By the end of 1983, 172 units had been produced, of which in turn 155 were [exported], primarily to the USSR. This was the basis for the subsequent development of model EC1056. This will begin to be produced in 1985, and with its even more expanded range of functions the transition to the next ESER series is being made on the part of the GDR.

Its important features are:

- Maximum main memory capacity of 4 megabytes,
- effective microprogram groups in the central processing unit EC2156 for the accelerated operating of virtual machines,
- high-powered special arithmetic unit (matrix module) for processing data fields, as an auxiliary attachment to the central processing unit,
- operating system OS/ES, version 7, with numerous function-expanding and throughput-accelerating improvements, which also includes an enhanced operating system SVM/ES and which enables the user to increase to an extraordinarily high degree the throughput,
- enhancements to the hardware-related and microprogram diagnostic tools as well as the autonomous diagnostic routines,
- control and service processor EC7069.M, organized as a multimicro-processor system.

With this model, former areas of application are handled more efficiently and new application possibilities are opened up, the latter especially wherever the capabilities for field processing, for interactive operation, and for remote network processing can be used.

The successful development of the model EC1056 constitutes a good prerequisite for being able to continue the course of production and exporting begun with the EC1040 and consolidated with the EC1055/EC1055.M.

Peripheral Devices in the GDR

For purposes of completeness and in consideration not only of the capabilities of the central processing units and operating systems but also of user requirements, it is an urgent necessity for these central components of any of the models to be continuously supplemented by high-performance and increasingly user-friendly peripheral equipment.

These peripheral devices are made available through developments within the GDR itself and, in line with the specialization agreement, by other participating countries of ESER.

Depending on the stage of development reached at the ESER at any given time and the associated degree of integration and specialization, the participation of the GDR in the development of input/output devices, external memories, and remote data processing equipment has been quite diverse. Building on the level reached with Robotron 300 in the sector of peripheral equipment, within a relatively short development time it proved possible to make available for the central processing unit EC2640 and to ESER a wide variety of external memories (magnetic tape and disk pack memories), input/output devices (printers, punched-tape station, query station), and remote data processing technology (multiplexors, subscriber points). As representative of these lines of devices we should emphasize especially the developmental contributions of the GDR in the area of magnetic-tape storage technology and in the sector of display-screen technology. And this is appropriate in particular because in ESER the functional and technical level of these devices is substantially determined by the GDR. By 1970 already, the development of a magnetic tape storage subsystem (EC5516/EC5016) had been completed and turned over to joint testing by the ESER, as the very first mechanical equipment to be so tested. This technology was continued in the subsystem EC5517/EC5017, which was developed in scientific-technical cooperation with developer collectives of the USSR, and recently in the system EC5525.03/EC5002.03. With this latest result of the teamwork between the two countries, a subsystem is made available to the user which is characterized by substantially improved performance and function parameters (recording density 800/1600 bits per inch; data transfer speed 96/189 kilobytes/sec). Within the framework of this cooperation, in the next few years another subsystem will be produced which will offer to the user even more attractive performance-value properties, which are achieved through the utilization of the recording process called group coding and the use of microdiagnostic tools.

The initial years of ESER were likewise the period of the commencement of development of display-screen devices in the GDR. It proved possible to market even with the EC1040 the display-screen system BSS ESER. It was the first such system for ESER and brought for the user a qualitatively new and more user-friendly form of teamwork between person and system (interactive

processing). Building on this, the display-screen system EC7920.M was conceived and developed. This product, which was designed in multilateral cooperation among the countries participating in ESER and was developed by the GDR, is a communication system which can be employed in either the local or remote mode, with application possibilities in data logging and interactive processing. Its options with respect to accessories and its versatile functional user-friendliness are representative features of EC7920.M as a leading product of ESER. Various elements of this display-screen system were used for the development of efficient operating units and subsequently control and service processors. Thereby it became possible early on to replace the query unit EC7073 with the operating unit EC7069--and with that the operating of EC1055, but also retrospectively the EC1040, could be improved to a significant extent. The hardware-related and functional level of these devices was and is an exemplary model for the other ESER developer countries, and it is highly rated by users of electronic data processing domestically and in other countries.

The developments on the part of the GDR in the sector of peripheral equipment for the ESER models are complemented by such devices as the microfilm output devices EC7602, the equipment station EC7902.M for punched-tape and cassette magnetic tape input/output, and by terminals based on the microcomputer K1520 for various areas of application involving remote data processing, inclusive of modernized remote data processing multiplexors. In line with the primary directions of specialization already mentioned initially, not all the peripheral equipment belonging to a particular model is developed and produced by the GDR. Therefore it is necessary to obtain devices from other participating countries of the ESER (for example, disk memories from the USSR and People's Republic of Bulgaria, parallel printers from the CSSR, remote data processors from the Polish People's Republic). But in order to ensure the functionally unified behavior of these devices with the other system components in such a way that the user can be guaranteed of this, extensive system-related work to guarantee compatibility and for incorporating these "foreign" devices into the inventory of our ESER models is necessary. Within the framework of scientific-technical cooperation with the partners in ESER, work is being carried out which includes the coordinating of the functional and technical parameters of the device components, of the ESER interface, the carrying out of functional checks on the peripheral devices, for example with EC1055.M at the test computer centers of the GDR, and the introducing of necessary device modifications. The inventory of the model EC1055.M contains many mechanical devices which are developed and produced by the GDR, but also many devices from the other ESER countries. Thus the model inventory is a demonstration that on the basis of multilateral cooperation among the socialist countries in the ESER and bilateral scientific-technical cooperation, efficient, functionally coordinated, and modern device components for supplementing the ESER computer models can be developed, produced, and made available to the user.

Contributions to Technical Development

To secure the performance and reliability parameters of the hardware components of our ESER models, manifold and complicated technological-

design research and development work had to be done. The results of this work have contributed significantly to the scientific-technical level of the products. They were made use of not only within the framework of ESER hardware development, but also in control computers of message switching technology (SK NEWA/NEWAl.M), with our country likewise successfully exporting such equipment to the USSR.

On the basis of joint analyses and commitments of the participating countries of ESER, the work has been keyed to the following central objectives:

- Securing the technical compatibility of the devices and device components with one another,
- securing relevant reliability parameters,
- determination of component product lines for the realization of hardware development and making this available to all participating countries on the basis of a division of labor,
- standardization of the scope and content of the documentation for the products which are made available to the user,
- formulation of the scope and nature of joint tests on the products after the completion of development.

With the results achieved it proved possible to develop and produce devices with a high performance value and with a steadily increasing economic efficiency.

Through the multilateral and bilateral exchange of scientific experience, especially with specialists from the USSR, substantial stimulants were imparted to the research and development work. Of special importance were the advances made by way of the incorporation of computer engineering in technological developmental processes for design recording, simulation, technical project planning, and automated manufacturing of data media for the production and testing of modules and of portions of the manufacturing documentation.

Following the development and production of the central processing unit EC2640 in Series 1 of ESER, it proved possible to substantially decrease the amount of effort required to develop the central processing units EC2655/EC2655.M and EC2156 and thereby to achieve significant results while lowering the expenditure for materials, the energy consumption, and the labor expended by society. A prominent part was played in this by the increasing degree of integration in storage circuits, whose use in memory structures of the central processing units was advantageous in achieving not only comprehensive capabilities but also manifold expenditure reductions.

A positive influence on the development of components in the GDR was exerted by the development of computer engineering within the framework of

the ESER. The high requirements placed in other ESER models on the technical parameters and on reliability, together with the requirement of broad applications, also had a stimulating effect on the development results. This became especially clear in the case of multilayer printed-circuit boards with an increased junction density and in the case of contact components having a small basic grid. We should also emphasize the successful work done in the sector of power-supply modules. An increasing degree of integration of the circuits placed greater demands on efficiency and/or a decrease in volume and a lowering of the material and labor expenditure for power supply modules. With the development of modern switched-mode power supplies without a power transformer and with a high pulse recurrence frequency, these goals could be achieved.

Through teamwork in the GDR it proved possible to make available a cooling fan with a high service life which meets the requirements of uninterrupted computer operation over a period of many years.

Of particular significance is the provisions made for customer services through the national customer service organs (NOTO). On the one hand these lighten the expenditures of the manufacturer in the exporting country, but at the same time they place higher requirements on quality and on the diagnostic resources for the products, on a steady and appropriate supply of replacement parts, and on suitable testing methods for modules.

Outlook

In September 1984, development collectives of the GDR will be satisfying their obligation with respect to the competition in honor of the 35th anniversary of our republic by presenting a new model EC1056, inclusive of the operating system OS/ES, version 7, to the international commission for joint testing. These development results will be applied with great economic effects.

At present, preliminary and development work for the next more advanced ESER models is being carried out, in which also the GDR is participating. With a guaranteeing of upward compatibility and by the use of the latest scientific-technical findings, in particular the possibilities offered by microelectronics, the following objectives are being worked out:

- A more advanced architecture for expansion and greater efficiency in the use of equipment of computer engineering,
- raising the operating speed and the real main storage capacity of the central processing units,
- building of local computer systems and extended computer networks,
- raising the external storage capacity, inclusive of the data transfer rate,

- new and improved input and output devices, especially for making more efficient and perfecting "human-system" communication, as well as operating systems,
- improved operating systems for further increasing program throughput and for expanding the range of functions,
- increasing reliability and improving the diagnostic and maintenance capabilities.

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CSO: 2302/43

RESEARCHER ON ION-BEAM LITHOGRAPHY IN IC MANUFACTURE

Leipzig LEIPZIGER VOLKSZEITUNG in German 27-28 Oct 84 p 10

[Interview with Prof Frieder Bigl, GDR Academy of Sciences Central Institute for Isotope and Radiation Research, by Manfred Schulze: "Ion Beams Could Break Barriers of Miniaturization"]

[Text] [Question] For years the development in microelectronics is moving in the direction of an ever greater packing density of the components. The tiny dimensions and, respectively, distances of the transistors, diodes, and tracks necessitate the search for new manufacturing technologies. They examine the application of ion beams for which a great future is predicted in this regard. In what areas of the manufacture of semiconductor components can they be employed with advantage?

[Answer] Prof Bigl: in order to accommodate large-scale integrated circuits (LSI) on a wafer, more than 100 work procedures are usually required. Many of them are repeated, however, several times in similar form, such as, e.g., steps for the cleaning of surfaces, the production of thin insulating, metal or semiconductor layers for the so-called structuring of these layers. An additional, presently very important working procedure is the doping of the basic semiconductor material or of certain areas of the wafer, whereby foreign substances are introduced for the purpose of changing the electrical properties. In principle, ion beams can be employed in any of the aforementioned four areas. Because of the usually higher costs of the devices they will be employed, however, only where and when "conventional" machining processes are failing. A simple example: Usually, a fluid--an acid, solvent, or water--is used for the cleaning of a wafer surface. When the cleansed layer reacts, however, very rapidly with oxygen of the air and the oxide layer is undesirable, it must be removed in the vacuum immediately before the next processing step. This can be done very well with ions. If they are shot on the wafer, the upper layers of material are pulverized like in a sand blasting plant.

[Question] LVZ: What advantages does the application of ion beams now have in particular for the further reduction of the components?

[Answer] Prof Bigl: The already mentioned structuring of layers must be carried out several times in a production cycle. For this purpose it is necessary, first of all, to produce a mask adhering to the layer. This is

done customarily by a photolithographic process resembling the known photographic process (exposure, development, etc.). In the LSI-circuits with 100,000 individual components produced today, the smallest dimensions are a few thousandth of a millimeter, whereas from today's standpoint the limits of reduction lie at about 1/10,000 of a millimeter. The manufacture of a mask with light is then no longer possible and electrons, X-rays or ions have to be used for exposure. Ion beams have the advantage that organic mask materials are very sensitive against them (productivity!), while they are scattered very little (sharpness of image!) in the mask and on the layer material and are offering as the only ones the prospect of being able to at least partially forego auxiliary masks, i.e. to "inscribe" the desired patterns, for instance, with a fine ion beam directly into the base or cover layer material. The problems of this "ion beam lithography" are, however, still so great that another decade will probably pass until it is ripe for production.

[Question] LVZ: Is the ion beam technology therefore still pie in the sky?

[Answer] Prof. Bigl: Not at all. The ion implantation, i.e. the shooting of ions into semiconductor materials, has been employed already for years in industries worldwide for the purpose of the already mentioned doping. The ion beam purification, as well as the production of thin layers by means of ion beam sputtering are also gaining in importance.

We ourselves are presently engaged in reactive ion beam etching. The previously discussed production of extremely fine structures in an auxiliary mask presents only the first step of microstructuring, and these patterns have to be transferred subsequently as accurately as possible into the layers belonging to the later component. With structural widths of less than one thousandth of a millimeter the conventional chemical wet or plasma processes are failing here too because the rims of the masks are undercut, with the result that the "ditches" are becoming too wide and the "bridges" too narrow.

Ion-assisted processes and ion beam processes can take remedial action here too, and make possible structural transfers with "edge displacements" of less than 1/10,000 of a millimeter. The industrial utilization of the new etching process has already started too, although intensive research and development work is still required in this area in order to transform that which is physically possible into what is technically usable.

12693

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MEASURING INSTRUMENTS ENTERPRISE ADOPTS ELECTRONICS, MICROPROCESSORS

Budapest NEPSZABADSAG in Hungarian 7 Nov 84 p 6

/Article by Katalin Bossanyi: "The MMG Wins Time and Markets"/

/Text/ One of the big questions--and from many viewpoints a still open question--of the renewal of our machine industry and strengthening competitiveness is: Can we link up in time with the structural changes which have taken place in the industry of the world, can we find developmental zones that suit our conditions on the basis of which we can move forward more effectively than heretofore?

The industrial policy conception designates a number of such breakthrough points, including that of the instrument industry, which has great traditions. Of course, what is involved is not at all instrument manufacture in the traditional sense. To learn more concretely what is involved one might look, for example, at the plans of the MMG Automatics Works.

The large enterprise still known after a decade as the Mechanical Measuring Instruments Factory (MMG) has radically transformed its product structure and carried out a technological generation change--without spectacular manifestations or special economic leaps. In the place of manufacturing classical measuring instruments they have switched to the complex realization of new electronic process control, measurement and testing systems which according to many can be regarded as one of the contending branches of the future.

Linked to a Driving Branch

"We were lucky, because we were able to link up in time to two driving technologies, the auto industry and the oil industry," director general Rudolf Fekete recalled the beginning. "From the end of the 1960's, on the basis of an interstate agreement, we manufactured instrument panels for the Zhiguli program; today we make 3,000 such instrument panels per day. But in addition to the Ladas, our products can be found in the Polski-fiats and the Zastavas, and thanks to a new cooperation we are beginning to manufacture Skoda instrument panels also. The other great opportunity was provided by the great Soviet petroleum and gas pipeline projects of the past decade. We made the regulating and measuring instruments for the pumping stations of the Friendship and Brotherhood lines and we installed, for example, the telemechanical system for

a Central Asian line 3,000 km long. In addition we are constantly delivering measuring instruments for the storage tank park of the Soviet enterprise corresponding to Afor /Mineral Oil Trade Enterprise/. And we participated in the delivery of regulating and control instruments for lines being built in Bulgaria, Czechoslovakia and Romania. Even today we export 60 percent of our production to the socialist countries, most of it to the Soviet Union."

These stable orders make it possible for the enterprise to develop by 11-12 percent per year, far exceeding the average for the machine industry. Their sales receipts increased in the past 10 years from 370 million to 2.7 billion forints. But the secure user background did not give comfort to the developers here. On the contrary, it prompted them to make technical and technological leaps. Kalman Pelhos, chief developmental engineer, talked about the causes:

"We saw that we could sell our mechanical systems at a good price for a good time yet, but we knew that if we did not take steps in the direction of using electronics we would unavoidable get hemmed in and fall behind. Frankly, in the beginning, there was no need for a change in regard to our big customers. So we aroused their interest with scientific-technical cooperation and created a common interest in modernization. We also recognized that we could not depend on our own small staff alone. Not only because of the danger of losing time but because of the well-known deficiencies of the domestic electronics industry as well. So we bought English, U.S., Canadian and Italian licenses and know-how. With time, the cooperation developed into development-production cooperation. Today all this not only increases our chances for capitalist export it also makes it possible for us to constantly keep up with the front line developments in the world."

The developmental advance was realized in two steps between 1975 and 1983, building closely on one another. They did not stop with the switch to electronics but immediately went forward into the use of computer technology as well. All this was a great test for the entire collective for not only did the leaders and engineers have to solve new tasks in a very short time but the workers also had to shift to new trades. They paid the tuition for this. Many of their workers left and those remaining had to be retrained or trained further mostly in inhouse-study courses. Today--and this illustrates the magnitude of the product change--the 90 percent precision engineering manufacture at the MMG Automatics Works has fallen to 40 percent, the rest is electronics. This enterprise has become the second manufacturer of microcomputers in the country, after Videoton. They produce 250 microcomputers per year to control the process control systems manufactured here. At the same time they computerized their own developmental-planning activity too. Among other things this contributed to the fact that at this enterprise productivity is increasing at a rate exceeding the expansion of production.

User Advantages

Istvan Bodor, technical deputy director general, while guiding us about the electronics factory unit, showed how this technology brings advantages to manufacture, and what it brings to the table for users. They also prepare the programs for the control units, which are built on the modular principle. At

the time of my visit they were assembling control elements for a process control and measurement system manufactured for the Northern Hungarian Power Enterprise, and they did computerized testing of the finished units. One of the big advantages of the microcomputer system is that it requires little space and saves on material and energy. Earlier, if the technology of a user changed they had to replace the entire telemechanical system. Now they simply reprogram the microcomputer. In addition to all this the production director did not fail to note that changing products twice required full-scale technological development--not counting the manufacture of microelectronic parts. Because of the backwardness of domestic background industry and the contingencies of interenterprise cooperation they were forced to manufacture practically everything themselves, which increased the investment costs and makes production more expensive.

The director general commented on this: "We carried out a billion forint investment twice in not quite 15 years--on time--and we were able to adhere to the planned costs too." But now they have problems. Even though the increase in profit is covering the repayment of the credits they have had to slow the pace of the product exchange, deviating from their original intention, due to the interest burdens and the constant withdrawals. Regulation up to now has held back an enterprise developing more quickly than the average, while favoring those following a "slow water" policy.

We should talk about another tension also connected with the structural transformation and embodied primarily in wage questions. Technical life at this enterprise was always effervescent; and they have a separate research institute dealing with modernization of measurement technology for the gas and oil lines. But since the technological switch the ratio of workers and white collar employees has tipped. It is very unusual in domestic practice if only half of a collective of 5,000 at a large machine industry enterprise are physical workers. Today many well-trained electrical and mechanical engineers work here, they have a number of knowledgeable computer technology experts, they have a separate program development staff and they employ physicists, mathematicians and, naturally, analytical economists and organizational engineers. Developing the highly-computerized process organizing systems requires significant intellectual investment. Which pays off quickly for the users, but the "price" is too small to pay the qualified specialists in proportion to their performance. They expect from the guidance and regulatory changes next year primarily a resolution of this contradiction.

"Of course, the change in products in itself would have been too little for winning markets if it had not been coupled with comprehensive changes in management attitudes," said Benedek Kutassy, chief of the prime contracting office.

"We develop and apply our process control systems to the custom needs of the purchasers, which means that in addition to the one-time seller-buyer contacts they increasingly require of us entrepreneurial-organizational and service activity. This is true of both our foreign and domestic jobs. I believe that this flexible enterprise behavior helped us to win new markets in the recent past."

Which means in the case of the MMG Automatics Works conquering the domestic market too--however strange that sounds. Earlier the Hungarian enterprises requiring modern process control systems preferred to get them from capitalist firms. Today, however, they have discovered the domestic special enterprise--in only small part because of the restricted import possibilities. It is true that if these modern regulating, measuring and control systems are to be used more broadly here at home it will be necessary for the users themselves to grow up to it. Because it is worth while and economical to use microcomputer process control only where the basic production processes are in order, where the work is well organized, on schedule and disciplined. In addition to the users of the traditional closed system technologies the new customers include the aluminum industry and various public works enterprises. But the Paks orders brought the real breakthrough. They will deliver the measurement and control equipment for the control technology systems for blocks III and IV of the nuclear power plant. Their newer developments will follow the path of the energy from producer through delivery to storage and processing. Here at home and abroad as well.

A Hard Lesson

"One cannot, one must not stop with structural renewal," the director general said. "Up to now we have always been able to be at least one step ahead of the needs of our customers. Now, however, we have had a hard lesson. Earlier, in the Soviet Union, it was primarily oil and gas users who used our equipment. But in the future we must go out to where these are being produced, to Tyumen. The difficulty is caused not only by the distance but also by the extraordinarily harsh climate. We must develop equipment which can bear temperature variations from minus 60 to plus 50 degrees Celsius, despite the high use of electronics."

"What will you be delivering to Tyumen?"

"We have obtained a commission to automate the gas lifts aiding secondary petroleum extraction. Last year we demonstrated prototypes which we shipped out together with a microcomputer, preassembled in a container. They tested it, and this year they ordered 40 of this type. This made us bold and we started new developments. By 1990 we will probably export 1,000 of these, while we export 200 of our oil well measurement stations. To illustrate the ratios, the value of such gas lift instruments is 3-4 million forints."

"Is the export economical?"

"Let me knock on wood. This deal is mutually advantageous. Instrumentation of energetics systems means a linking of technologies which could aid the development of our enterprise for a long time."

8984

CSO: 2502/13

ELECTRONICS INDUSTRY BESET BY PROBLEMS

Budapest MAGYAR HIRLAP in Hungarian 28 Nov 84 p 7

[Text] According to Dr Sendor Mihaly, executive director of MEV [Microelectronics Enterprise] there is much recrimination between producers of electronic equipment and the manufacturers of parts. Each party blames the shortcomings of the industry on the other. Equipment producers complain that they are unable to obtain certain state-of-the-art parts because they are on COCOM lists. To make matters worse, domestic parts producers set delivery dates years in the future while circuits available from socialist sources frequently lack satisfactory documentation.

The excessive price of parts is considered the most painful issue: domestic or Bloc produced circuits cost 50-100 percent more than current world market prices. (Higher production costs are merely one obstacle to radical reduction of import prices.) Everyone calls for faster development, more dynamic exports from the producers of electronic apparatus. However, it is virtually impossible to expect apparatus prices which are competitive abroad while prices for parts are unrealistically high.

The situation viewed from the side of parts producers is as follows: In the coming years producers of equipment will be able to meet 40 percent of their demand for parts from domestic sources. However, it is true that the equipment contains only 15 percent "active elements" in other words, integrated circuits and semiconductors. These elements are produced in Hungary by MEV, and the parts shortage looks quite different from the MEV angle.

An American production line and license for encasing integrated circuits was purchased 8 years ago. Although the possibility of buying additional licenses disappeared in the meantime, the MEV factory at Gyongyos currently welds out-lets on 20 million to 22 million microcircuits annually, computer checks them and encases them. Since this quantity is double domestic demand, ample remain for export. The same holds true for the 60 million other semiconductors produced each year. While there are no quantity problems, selection satisfies only 60 percent of demand. To this one must add that domestic equipment manufacturers use 6,000 types of integrated circuits. Specialists maintain that even 300 types would be excessive. One reason for such intemperate demand is that designers--not without reason--mistrust specifications and prefer to use types of proven reliability.

The year MEV will complete pilot operation of two so-called wafer production lines. Consequently, it will not need to import microcircuits next year. In possession of the production technology for MOS and bipolar integrated circuits, it will be able to ship virtually all types of mail-order types of circuits. The only question is at what price. According to factory specialists, integrated circuits prepared with 5-6 year old technology are made at no greater cost than the West European average price plus customs charges. (This includes the 12-14 year old TTL, the 6-7 year old LS-TTL and the 5-6 year old CMOS technologies.) Consequently, 85 percent of the integrated circuits produced are sold at world market prices. The situation differs in the case of more recent technology. Three or 4 year old integrated circuits cost 3.5-4 times above world market prices to manufacture.

The central programs elaborated in 1981 to determine development of MEV expected the enterprise to make mail-order type circuits at one-and-a-half world market prices and to realize its profits from custom-designed (equipment oriented) circuits of which they planned to make 100,000 annually and which could be used in place of 10-20 integrated circuits of less complex design. The cost of such custom-made circuits is merely 20 percent of that of their foreign-made counterparts. What makes such circuits cost effective is that 60 percent of their value derives from intellectual input which is notably cheap in Hungary.

The new method of designing circuits requires a change of attitude which upsets ingrained enterprise routines. Yet a certain reorientation in the approach of electronics engineers has become evident world wide. More and more specialists who previously constructed apparatus are now designing parts. Nevertheless, a course offered at Budapest Technical University this fall aimed at acquainting engineers with the approaches to custom-made circuitry design began with a lower than planned enrollment due to lack of interest.

Before we reproach producers of equipment for their backwardness, it may become evident that today's regulators offer insufficient incentive to gain widespread enthusiasm for custom-made circuitry. This is because as long as a manufacturer has his own people design and fabricate boards, he needs pay nothing extra; it is part of general overhead. On the other hand, if he buys a more complex, finished circuit from another firm, his purchase price will include the seller's hidden sales tax.

The question also remains as to whether it is truly expedient to base the income generating potential of electronic parts production exclusively on a higher proportion of custom-made circuit production. Over the long term, not even Hungary will be able to continue paying so little for the intellectual input involved in the design of such circuitry. There is no way of knowing whether already expensive parts will become still more costly or whether technological advances will permit manufacturers to cut production costs. This is the great dilemma which affects not only an important branch of industry but the economy as well.

COMPUTER, MICROPROCESSOR DEVELOPMENTS DESCRIBED

Computer Inventory, Investments, Centers

Warsaw PRZEGLAD TECHNICZNY in Polish 7 Oct 84 pp 20-21

/Article: "Computers, Count Them!"/

/Text/ Last year much ado was made in the press about the so-called Pawlak Report, named after the director of the Secretariat of the Committee on Information Science that in theory works with the Council of Ministers but in practice works with the Ministry of Science, Higher Education and Technology. This institution collected extensive data illustrating our complete destitution in information science. Today, thanks to the kindness of MERA /Automation and Measuring Industry Association/ and the editorial staff of its BIULETYN, we are able to present the latest indexes, the significance of which, unfortunately, is not in the least optimistic. This data was prepared for MERA by Romana Sachnowska of the Research and Development Center for the State Statistical Information System associated with the Main Office for Statistics.

The most recent statistical survey of computer centers was conducted in 1984. Reports from 1,403 centers were examined. These centers met at least one of two conditions:

- they possessed computers,
- they employed at least five people.

The remaining reports were submitted by centers not equipped with computers. The average number of people employed by these centers was 2.6.

Compared with 1982, the number of centers issuing reports decreased by 29. Among the 1,403 centers, 152 (10.8 percent) are self-supporting with respect to resources. They employ 44.8 percent of all information science workers, an average of 132.8 persons per center (compared to 138.6 last year). In the remaining 1,251 centers, average employment is 19.9 persons (18.9 last year).

Each center on average performs three types of tasks. Most of the centers prepare data media, process data on computers, and design and generate software. Centers doing research and development work decreased the most (32), but centers involved with the installation, maintenance and repair of computers increased by 18.

Compared to 1982, the number of centers located in the ministries and provincial administration offices was practically unchanged. Over 25 percent of the centers and 21.5 percent of the employees continue to be subordinate to the Ministry of Metallurgy and Engineering Industry. Among the provinces, Warsaw City Province has the largest percentages of centers and employees among the provinces, 18.3 percent and 21.3 percent, respectively.

At yearend 1982, the computer centers employed 45,088 people, a 2 percent decrease from 1982. The decrease in employment is most obvious among programmers, designers and so-called "all other primary operation workers." The share of computer maintenance personnel and auxiliary operating personnel increased.

Almost every third person employed by a information science center has a higher education. Since 1981 the employee dismissal factor greatly exceeded the employee-hire factor, reaching a level of 19.9 for hires and 21.2 for dismissals in 1982. In several worker groups, both factors are much greater than average (for example among computer operators).

The average pay in information science centers in 1983 was 11.754 zlotys, a 30.7 percent increase over 1982 (in the previous year the increase was 42.5 percent). Compared to previous years, a pay leveling trend among employees in different positions is obvious. In 1979, pay for computer operators (the lowest paid group) was 16.5 percent below average, but pay for designers (the highest paid group) was 38 percent above average. In 1983 these same groups of workers were still among the lowest and highest paid groups, but the difference was only -5.4 percent and 25 percent, respectively.

Large pay differentials among the ministries are still obvious. The difference between the lowest and highest averages 3,867 zlotys. Differences in average pay for specific groups of workers are even greater, for example, 5,433 zlotys between designers and analysts, and 6,084 zlotys among administration office workers.

Compared to 1982, the value of information science products and services, the value of sold goods and services and manufacturing costs increased over 20 percent. Manufacturing costs rose 51.2 percent since 1979.

Tabela

1. Wyszczególnienie		1981	1982	1983	1983 % 1982 = 100 1981 = 100	
2	Ogółem ośrodki	1575	1432	1403	97,9	89,1
3	Samodzielnie bilansujące	144	148	152	102,7	105,5
4	Pracownicy ogółem (w tysiącach) w tym:	51,3	46,0	45,1	98,0	87,9
5	projektanci systemów i analitycy	5,9	5,0	4,8	96,0	81,3
6	programiści	6,2	5,2	4,8	92,3	77,4
7	operatorzy	18,4	17,0	17,0	100,0	92,4
8	konservatorzy	5,4	4,9	4,8	97,9	88,8
9	Pracownicy na 1 ośrodek	32,6	32,1	32,1	100,0	98,5
10	Pracownicy ośrodków samodzielnych bilansujących (w tysiącach)	22,5	20,5	20,2	98,5	89,7
11	Wartość prac i usług informatycznych	14481	16316	19914	122,0	137,5
12	Nakłady inwestycyjne	1910	2800	3573	127,6	187,0
13	import sprzętu z KK	85	82	139	163,5	169,5
14	Komputery ogółem (sztuk) z tego wg klas pojemności pamięci wewnętrznej:	2633	2553	2648	103,7	100,6
15	8 do 64 KB	1906	1813	1841	101,5	96,6
16	5 do 256 KB	485	483	484	100,2	99,8
17	257 do 512 KB	204	209	231	110,5	113,2
18	powyżej 512 KB	38	48	92	191,6	242,1
19	Komputery duże i średnie z tego wg klas wieku:	874	829	840	101,3	96,1
20	1 do 3 lat	109	49	30	61,2	27,5
21	4 do 5 lat	150	129	83	64,3	55,3
22	6 do 8 lat	355	317	281	88,6	79,1
23	8 do 10 lat	139	193	235	121,7	169,1
24	powyżej 10 lat	115	141	211	149,6	183,5
25	Przeciętny wiek (lat)	7	8	9	-	-
26	Minikomputery (sztuk) z tego wg klas wieku:	1759	1724	1808	104,9	102,8
27	4 do 5 lat	291	352	454	129,6	156,0
28	6 do 8 lat	831	856	477	72,7	57,4
29	9 do 10 lat	127	285	452	177,2	355,9
30	powyżej 10 lat	11	37	118	318,9	1072,7
31	Przeciętny wiek (lat)	5	6	6	-	-
32	Urządzenia do przygotowywania maszynowych nośników danych:					
33	rejestratory danych (sztuk)	665	669	835	124,8	125,5
34	dziurkarki i sprawdzarki kart	10563	9444	8997	95,2	85,2
35	Urządzenia transmisji danych					
36	- końcówki inteligentne (sztuk)	70	77	104	135,1	148,6
37	- końcówki nieinteligentne	3744	4319	4485	103,8	119,8
38	- urządzenia sterujące transmisją danych	511	654	746	114,1	146,0
39	Struktura czasu pracy komputerów wg tematyki opracowań ogółem (%)	100,0	100,0	100,0	-	-
40	Automatyzacja procesów technologicznych	16,7	14,6	13,1	-1,2	-3,6
41	Automatyzacja prac zawodowych	17,1	18,6	18,5	+0,1	+1,4
42	Zarządzanie w tym:	66,2	67,1	68,4	+1,3	+2,2
43	przygotowanie, planowanie i kontrola wykonania planów	6,2	6,2	6,8	+0,4	+0,4
44	gospodarka materiałowa	12,8	12,8	13,0	+0,2	+0,2
45	gospodarka wyrobami	5,1	5,3	5,5	+0,2	+0,4
46	rozliczenia finansowe	14,6	16,9	17,4	+0,5	+2,8
47	gospodarka kadrowa	4,0	4,4	3,9	-0,5	-0,1
48	statystyka i analiza ekonomiczna	7,4	6,9	6,5	-0,4	-0,9

Key:

1. item
2. total number of computer centers
3. centers self-supporting with respect to resources
4. total number of employees (in thousands) including:
5. system designers and analysts
6. programmers
7. computer operators
8. maintenance personnel
9. employees per center
10. number of people employed in self-supporting centers (in thousands)
11. value of information science products and services
12. investment outlays
13. equipment imported from the capitalist countries
14. total number of computers, including according to main memory capacity
15. 8 to 64 KB
16. 65 to 256 KB
17. 257 to 512 KB
18. greater than 512 KB
19. large and medium computers, including according to age class
20. 1 to 3 years
21. 4 to 5 years
22. 6 to 8 years
23. 8 to 10 years
24. over 10 years
25. average age (years)
26. total number of minicomputers, including according to age class
27. 4 to 5 years
28. 6 to 8 years
29. 9 to 10 years
30. more than 10 years
31. average age (years)
32. data carrier preparation equipment
33. data recorders
34. card punchers and verifiers
35. data transmission equipment
36. intelligent terminals (units)
37. dumb terminals (units)
38. data transmission control equipment
39. computer operation time structure according to application (total percent)
40. automating technical work
41. automating professional work
42. management work, including
43. preparing, planning and monitoring plans
44. materials management
45. management of manufactured goods
46. financial accounting
47. personnel management
48. statistics and economic analyses

In the structure of manufacturing costs for products and services, the rising share of costs of materials is noteworthy. Among costs of material, depreciation's share decreased significantly, and the share of purchased parts and magnetic disks increased.

Sales of service outside the individual ministries increased significantly (about 29 percent) in 1983. Over 60 percent of all services are sold to ZETO /Electronic Computer Technology Enterprise/ service units, which are subordinate to the Ministry of Science, Higher Education and Technology.

Investment outlays in information science centers increased 27.6 percent compared to 1982, that is, 88.4 percent of 1979's level. Imported machines and equipment were allocated 16.1 percent of the total outlays. The share of imports from the capitalist countries was 3.9 percent, or not quite 140 million zlotys.

In 1983 there were 2,648 computers in the information science centers, 95 more than in 1982. Despite the increase in the total number of computers, the average computer age remained unchanged at 7 years from the previous year. The situation appears to be much more alarming relative to large and medium computers: 86.5 percent of these computers are more than 5 years old, and over 25 percent are more than 10 years old. The share of computers that are between 1 and 3 years old decreased from 21.6 percent in 1979 to 3.6 percent in 1983.

Among the minicomputers, the most numerous group is the 6- to 8-year-old group (26.4 percent). Minicomputers that are 9 or more years old already represent 30 percent of the total. But those in the 1- to 3-year-old group represent 17 percent of the total compared to 28.8 percent in 1983.

In developing the data for 1982, the minicomputers were divided into two main memory capacity groups: from 8 to 32 KB, and from 33 to 64 KB. It turned out that 52.4 percent of all the computers are in the first memory capacity group, containing barely 7.1 percent of total main memory capacity.

Compared to last year, the number of computers having main memories exceeding 512 KB increased significantly, almost double. Total computer main memory capacity increased along with this. Compared to 1982, the increase was 54.6 MB.

Computer configurations changed very little in 1983. If we neglect "other equipment," in which very diversified equipment is classified, often by chance, then disk transports had the greatest increase (17 percent), and monitors decreased the most (87 percent of the 1982 level).

The amount of data preparation equipment decreased 3.1 percent. About 88.2 percent of the equipment is operational. The amount of traditional equipment (card and tape punchers and verifiers) is decreasing significantly, but the number of data recorders is increasing. They represent 5.9 percent of all the equipment (4.5 percent last year), and the number of data entry stations is 2.436.

The amount of data teletransmission equipment in information science centers is increasing yearly, but the rate of increasing is diminishing. In 1983 the increase was 3.2 percent, and there were a total of 7,640 units.

Calculators are still being used in information science centers. In 1983 their number decreased by 15 percent, that is, 633 units remained, of which 87.8 percent are operational.

The location of computers in the ministries and provinces did not change much. As in 1982, the four largest economic ministries (Ministry of Mining and Power Industry, the Ministry of Metallurgy and Engineering Industry, the Ministry of Chemical and Light Industries and the Ministry of Construction and Construction Material Industry) and the Ministry of science, Higher Education and Technology possess 83.6 percent of all large and medium computers and 57.8 percent of all minicomputers; 67.4 percent of the large and medium computers and 66.8 percent of the minicomputers are located in the seven most industrialized provinces (Warsaw City, Katowice, Wroclaw, Gdansk, Lodz City, and Poznan).

In 1983, the average daily computer operating time was:

- 9.7 hours for large and medium computers,
- 4.6 hours for minicomputers.

In terms of working days they are 18.2 and 6.7 hours, respectively.

The computer work shift factor did not change from 1982, and averages two shifts for large and medium computers, 1.9 for Polish computers, 2.1 for imported computers and 1.1 for minicomputers (1.1 for Polish minicomputers and 1.2 for imported minicomputers).

Concerning the structure of operating time use for large and medium computers (domestic as well as imported), the increase in down time is obvious, especially organizational operating downtime.

An increasingly smaller share of operating time is also characteristic of imported minicomputers. Only among Polish-produced minicomputers is the trend reversed: the share of operating time increased from 62.7 percent in 1980 to 66.3 percent in 1983.

In 1983, some types of computers displayed a much higher than average ratio of down time to operating time (technical as well as organizational). For large and medium computers this ratio averaged 26.8 percent, but for the R-32 it was 33.8 percent; ODRA 1304, 48 percent; ODRA 1204, 68.9 percent. For minicomputers, this index was 47.4 percent; 50.9 percent for the MERA 305; 58.7 percent for the SMB; and 63.6 percent for the Wang 2200B.

The structure of computer use time according to application is changing slowly but systematically in the direction of decreasing operating time for controlling technological processes. But the share of time for automating professional work is increasing, especially on equipment (a 4.1 point increase since 1979). Within the framework of time designated for management tasks, the share of financial calculations increased greatly, but the share of statistics and economic analyses has decreased.

Spectrum Minicomputer Imports

Warsaw ZYCIE WARSZAWY in Polish 9 Nov 84 p 2

/Article: "A Valuable Gift From an Austrian Firm; Teaching With a Computer"

/Text/ Reiter, the Austrian firm that is the exclusive importer into Poland of Sinclair (a British firm) computer equipment, which can be seen at the Hotel Victoria, offered our schools 300 Spectrum personal computers. Mr Reiter believes that this is the best way to promote minicomputers in Poland, which still are not too popular.

Practically all over the world students, even in the lowest grades, are using computers, to say nothing of the popular video games. Specialists believe that the best time to learn the secrets of programming and minicomputer uses is between the ages of 10 and 12.

With the aid of such equipment, one can learn practically everything, from mathematics to singing. Such a minicomputer can even help to set up listings of tasks, the yearly nightmare of school directors.

Thus, the uses of minicomputers in school are practically unlimited. But the possibility of schools obtaining minicomputers is limited. One such personal computer, the Spectrum, costs 280,000 zlotys without a monitor and tape recorder (every school probably has these anyway) and a printer. Thus, the gift of Mr Reiter from Linz is all the more appreciated. But a computer is not everything. Proper programs and people who know how to use them also are needed. The Austrian firm also promised help in this area. Two enterprises that are collaborating with Reiter are authorized to provide this help: Labo of Bielsko-Biala, which will assemble, test and service the Sinclair minicomputers; and the Nowatech Enterprise for Modernizing Technological Processes, which will provide the software for the minicomputers in accordance with the needs of Polish consumers.

It has been proposed that the Ministry of Education and Upbringing develop educational software that is appropriate for the schools. The ministry distributed the 300 minicomputers among those schools that will benefit most from them (electronics and communications technology schools and schools of economics). What has happened, though, is that when several schools in Katowice Province received such a "toy" as an experiment, the school principals locked them up in a closet so that--God forbid--the students would not break them.

MIKROSYSTEM IK-80 Microprocessor System

Warsaw WIADOMOSCI TELEKOMUNIKACYJNE in Polish No 5-6, May-Jun 84 pp 44-45

/Article by Engineers Witold Zatorski and Wlodzimierz Gornisiewicz: "The MIKROSYSTEM IK-80 Laboratory-Educational Microprocessor System"

/Text/ Purpose and Assignment

The universal IK-80 microprocessor system was developed by the IE-PL Measurements Equipment Systems Group in association with the ever-increasing use of microprocessor technology, including in the area of metrology.

The basic version of the IK-80 will provide students with practical knowledge of the operating characteristics of a microprocessor system (while working in the Problem Workshop during the eighth and ninth semesters). The expanded version of the system has parameters that permit it to be used to do some master thesis work (data activation systems, intelligent A/D and D/A converters and the like) and to conduct some types of research and development work.

Technical Parameters

The IK-80 microprocessor system consists of three separate modules: the central processing unit (CPU), the console and the power supply.

The CPU contains the following functional blocks:

- a K580 1K-80 microprocessor (Intel 8080 equivalent);
- a 2 x 1kb RAM (equipped with a R/W signal hardware block independent of each kb);
- a 2 x 2 kb ROM (using a EPROM 2716 memory; the programmer is located on the CPU -board);
- input ports: two 8-bit registers;
- output ports: two 8-bit registers;
- an interrupt system eight levels (programmed priorities);
- switches-RESET (system restart); HOLD (system hold); SBS and 1 ST (step operation switches);
- an 8-bit microprocessor status indicator;
- a 16-character programmable display (7-segment characters);
- a 25-key keyboard: 24 programmable keys + 1 key operating in the interrupt mode;

- a 64-point electroluminescent-diode matrix (8 lines + 8 columns) that is programmable;
- an acoustic system consisting of a 4-bit D/A converter with an added audio frequency amplifier and loudspeaker (programmable);
- connectors to expand memory capacity;
- connectors to increase the number of I/O ports;
- connectors to permit operation with a system in the DMA (Direct Memory Address) mode.

The console consists of the following functional blocks:

- a 6-character hexadecimal display (4 address characters + 2 data characters);
- a 20-key keyboard, 16-hexadecimal keys + 4 functional keys: A/D--address/data, CLR--zeroing, ↑ increase address, ↓ decrease address;
- a 1-KB RAM (interchangeable with the ROM);
- a set of 5 switches and 10 light-emitting diodes providing information about the console's operating mode.

The power supply supplies all the required voltages.

A special characteristic of the system is its mechanical construction. All of the CPU's functional blocks (microprocessor, RAM, ROM, I/O and so forth) are located on a single 380 mm x 400 mm board in such a way that a student can visually recognize the system's structure.

Using the IK-80 System

The mentioned parameters of the IK-80 MIKROSYSTEM allow the student to become acquainted with all the basic ways of operating microprocessor systems. In the initial phase of learning, the students obtain the system without software. Their task is to create programs that will permit the use of specific functional blocks of the CPU. Among other things, the software is designed to generate geometric figures, static and dynamic, on the diode matrix, and to generate audio signals and simple melodies with the aid of the acoustic system. This is accomplished by the console operating in the DMA channel and by the microprocessor's step operation system.

In the next phase, the students use system software that permits them to:

- write software using the keyboard and display located in the CPU;
- execute programs located in any area of memory;
- set markers to facilities the testing of newly-created software;

--operate with a paper tape reader and perforator (CT 2100 reader, DT105S perforator).

To conduct directed projects, it is possible to connect to a system of specialized packets. A/D and D/A converter packets have now been developed, including multiplier converters.

It is projected that the system will be used with a switching converter as a block to gather and process analog data with the simultaneous possibility of outputting the results in graphic form on an X-Y plotter, oscilloscope or graphic monitor.

To construct the IK-80, only components produced in Poland or in the socialist countries were used.

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